THE GEOGRAPHICAL MAGAZINE

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PHOTOGRAPHIC NOTES

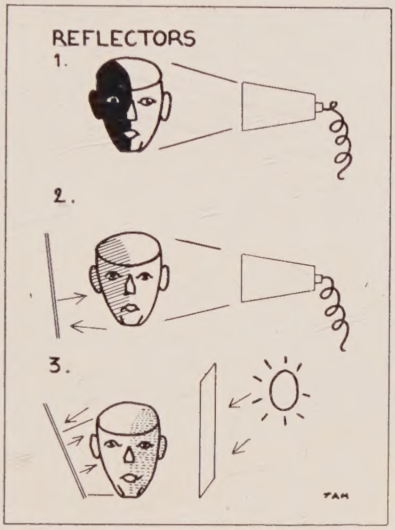
Edited by F. S. Smythe

29. THE USE OF REFLECTORS

The photographer accustomed to working in a studio with the aid of artificial lighting is usually well acquainted with the virtues of carefully but unevenly balanced lighting from both sides when making portraits.

One of the simplest ways of producing this effect is the use of a reflector on the shadow side of the face. This reflector throws back a certain amount of light and softens the shadows, thus giving a more pleasing effect than could otherwise be obtained with one light source.

Reflectors probably played their most important part in photography in the early days of the movies. Nowadays, when the vast majority of pictures are made on 'stages' with artificial lighting, reflectors are becoming increasingly rare. They are, however, still widely used for out-door shots and location sequences. As usual, the still photographer has much to learn from the professional ciné-photographer, and the use of reflectors should be understood by all serious amateurs who intend to control, if possible, the lighting effects achieved in their pictures.



The hard shadows indicated diagrammatically in Fig. 1 can be softened by the use of a reflector (as in Fig. 2). A reflector can also be used to throw a beam of light on an object which cannot be moved out of the shade (Fig. 3)

A reflector, it should be made clear, does add to the amount of light on the subject. In other words, when using reflectors, alterations in exposure may be necessary. A reflector, however, does not double the amount of light coming from the original light source. If, for example, you would consider 1 second at f.8 sufficient exposure when making a portrait with the aid of one photoflood lamp, it would not necessarily be possible to give ½ second at the same stop when using a reflector for lighting the shadow side of the face. The reason for this is, of course, that a reflector cannot possibly pick up all the light not already reaching a subject and that, anyway, all reflectors absorb a certain amount of the light falling upon them.

Even when using two photofloods in the home, a reflector may prove extremely useful for producing a third light-source and therefore a means of softening certain shadows which the photographer may deem unnecessary or ugly. It can be safely said that, however many lights you are using, the possibility of employing a reflector as an accessory means of illumination should never be overlooked. With one photoflood lamp a reflector is essential. It should be placed on the shadow side of the face to relieve the hard contrast which would otherwise result from a single light source shining from one side.

But if reflectors are useful when working indoors with photoflood lamps, they are equally useful when making portraits by sunlight. For example, a reflector is almost essential when making a window portrait, that is, with the subject seated in a well-lighted window with one side of her face illuminated by sunlight and the other side of her face towards a relatively dark room. A reflector should be placed on the floor against a table or chair so that it throws the reflected sunlight on the side of the subject's face that is away from the window.

Out of doors a reflector can be used in the same way, and photographers who have been quite content with their outdoor portrait pictures will be surprised at the quality and lighting effect thus produced.

For want of anything else, a plain sheet of newspaper makes an excellent reflector for out-door work. More stable reflectors can be made from sheet aluminium tacked over a sturdy, though not too heavy, wooden framework. Aluminium is particularly useful because it does not so readily absorb the ultra-violet and short-wave colours of the spectrum as do other metals. An enamelled basin is a good substitute.

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The Pilgrimage to Croagh Patrick

by RODNEY GALLOP

EVERYONE knows that, in the words of the song, St Patrick, the Patron Saint of Ireland

> . . . Gave the snakes and toads the twist
> And banished them for ever . . .

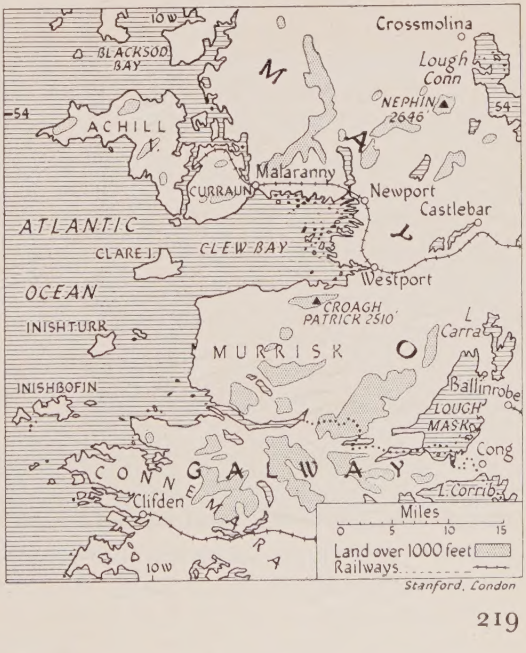
from the Emerald Isle. Few English people, however, know when, and still fewer know where, the extirpation of Ireland's vermin took place.

In the year A.D. 449 St Patrick, the erstwhile captive who voluntarily returned to convert his captors to Christianity, retired to the summit of a remote mountain in Connaught where, like his Master, he fasted for forty days and nights in the wilderness, communing with angels, seeing visions and weeping in his ecstasy until his chasuble was wet with tears. Here it was that he repeatedly cast his little communion bell into the air, and that each time it was miraculously returned to his hands, while with every cast the demons and reptiles were driven deeper into the dark crater of Lughnaghoul on the north-east face of the mountain. Here, too, as the mediaeval monks would have it, he prayed that the Saxons might not abide in Ireland so long as he dwelt in Heaven. When this prematurely nationalistic wish was rejected, he fell back upon another prayer, of which his obstinate insistence won the grant ; namely that on the Last Day he and no other should sit in judgment on the Irish Gaels.

Since then the mountain has borne the name of Croagh Patrick, and, with the possible exception of St Patrick's Purgatory on Station Island, Lough Derg, it is the holiest spot on Irish soil. Every year, on the last Sunday in July, it is the scene of a vast pilgrimage from all parts of Ireland. As many as 40,000 people climb the arduous track to the hallowed summit, and special ships bring pilgrims from the other side of the Atlantic.

Having seen great pilgrimages in the more southerly lands of Greece, Portugal and Mexico, I thought it would be of interest to compare them with the greatest Catholic pilgrimage in the British Isles. So, on the appropriate day last year my wife, my children and I joined the throng of pilgrims up the Reek, the name by which Croagh Patrick is known to all Irishmen.

For two days it had rained as it can rain only in the West, and we came near to abandoning our plan. Sunday dawned more hopeful, and the day gradually cleared and grew bright. By rights we should have been under way before daylight but we came from far, and circumstances prevented us from reaching the foot of Ireland's Mount Sinai before noon.



Stanford, London

Kildownet Castle on Achill Island, one of several strongholds belonging to Grania O'Malley of Clare Island, the pirate Queen of the Irish West who visited Queen Elizabeth on equal terms

From afar Croagh Patrick had been a steep, volcanic cone of a flat, airy blue, suspended over Clew Bay and Westport, dominating by its isolation rather than by its height the other mountains of Mayo. Now, from the foot, its dark and stony slopes rose menacingly into the cloud-cap which hid the summit.

Before dawn the first pilgrims had begun the ascent, fasting and many of them barefoot. The press had been thickest at dawn, for, from six in the morning till midday, mass had been celebrated without intermission by twenty-two priests in the little chapel on the summit.

Although we were thus behindhand, and more people were going down than coming up, we were by no means alone in our ascent, and even on the downward way we still met a few belated pilgrims on the upward path.

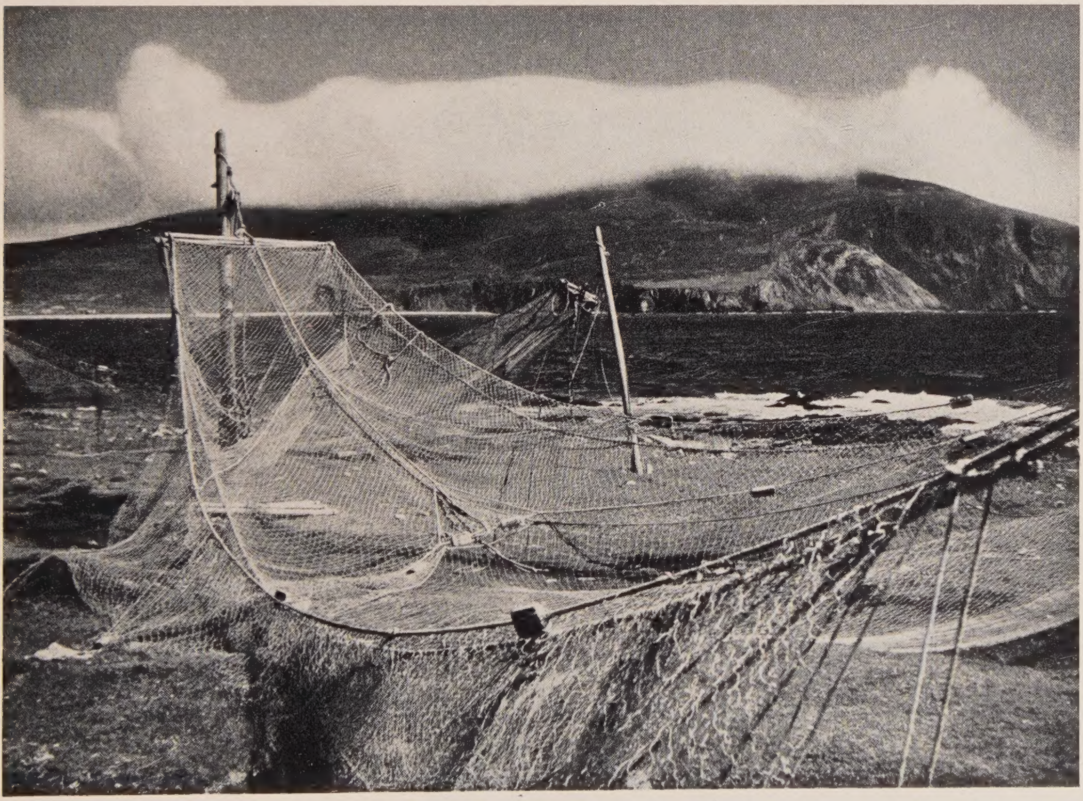
Where the path emerges from the fields of Murrisk onto the bare mountainside, a statue of St Patrick in mitre and chasuble bestows an eternal blessing on those who approach his sanctuary. The pilgrims take holy water from a stoup, cross themselves and strike boldly up the mountain. Each buys a beribboned medallion to pin on his coat, and a stout staff to help him on his way. They are of all classes, of all ages. The old and infirm, those delicately nurtured in cities, find in their faith the inspiration to carry them up the rough and stony track which is child's play to peasant men and women from Donegal or Mayo. One misses, of course, the picturesqueness of costume which brightens the Portuguese pilgrimage to Viana do Castelo or that of the Otomi Indians to the great Catholic shrine of Chalma in Mexico. But here and there you may see an old woman from Connemara in red skirt and patterned shawl, while the scent of peat smoke is wafted from the homespun tweed of many a farmer or fisherman.

As we clamber upwards, a wonderful panorama is unfolded in the sunshine: Clew Bay with its innumerable islets, the sea blue as enamel, the land the golden cloisonné of its setting. From Achill Island, past Curraun and Malaranny to the rounded hump of Mt Nephin the best of Mayo is outspread at our feet. To the west, half hidden by a jutting spur, is Clare Island, home of Grania O'Malley, the pirate Queen of the Irish West, who on one historic occasion visited Queen Elizabeth on equal terms.

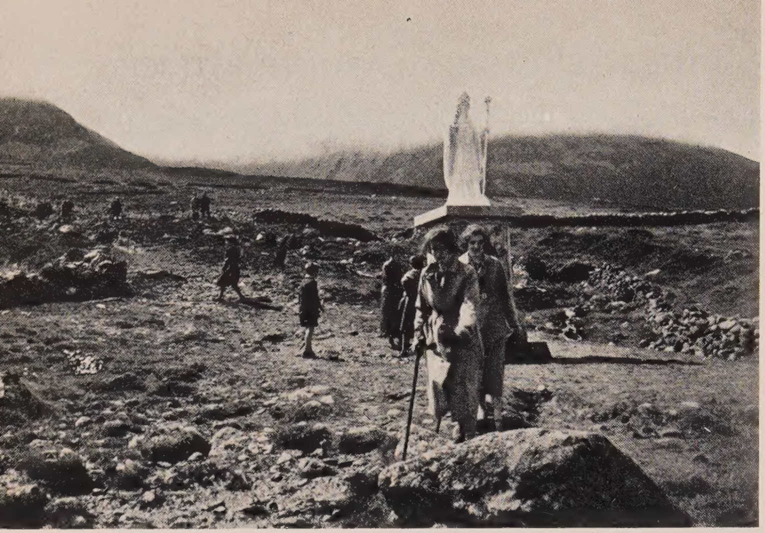
Half-way up, a great body of pilgrims pass us, for the last mass is over. We are now on a broad ridge, making our way along the skyline. The last steep path up the south-east face of the cone swarms with little ant-like figures half a mile distant. A dip in the track hides them from view, until they reappear fifty yards away, restored to human appearance, differentiated once more into old and young, men and women.

At the foot of the last steep ascent is the First Station of the Cross, a simple wooden cross beside a rough *leacht* or mound of stones and earth. Here the pilgrims pause to say seven Paters, seven Aves and one Credo. Then they revert for a moment to unconscious sun-worship, walking seven times sunwise round the *leacht* before continuing their climb.

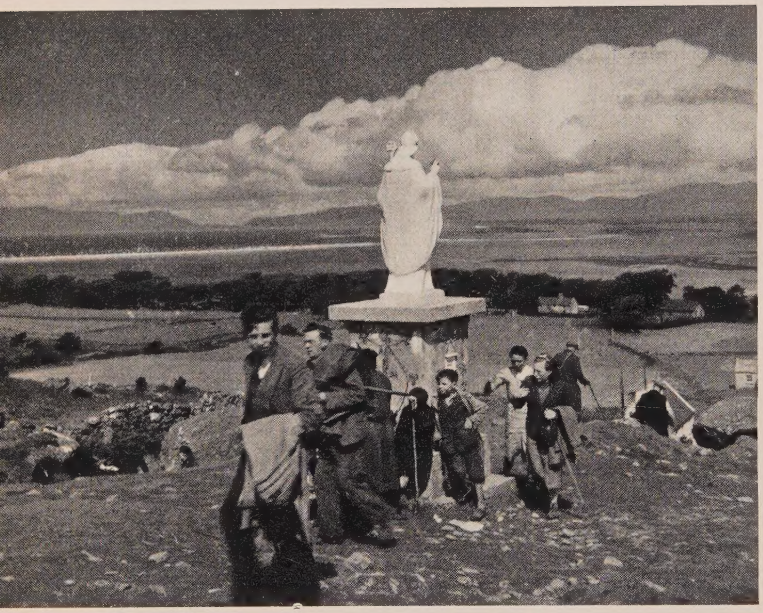
The Second Station stands where the path debouches on the summit, but of the other ten we could find no sign. Instead,



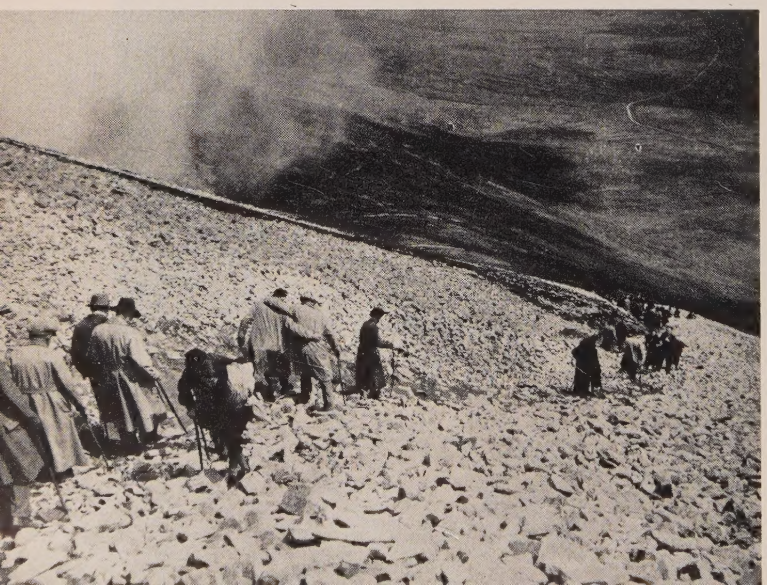
Fishing nets drying at Keel (Achill Island). Many legends of St Patrick survive among the hardy people who wrest a living from the Atlantic on the rocky coast of Western Ireland



Where the path emerges from the fields of Murrisk onto the bare mountainside, a statue of St Patrick in mitre and chasuble—



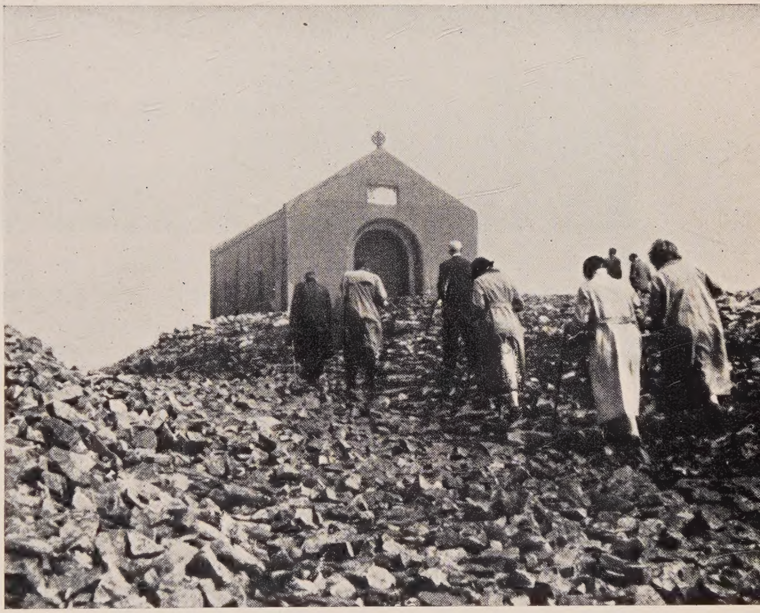
—bestows an eternal blessing on those who approach his sanctuary. The pilgrims take holy water from the stoup, cross themselves and strike boldly up the mountain



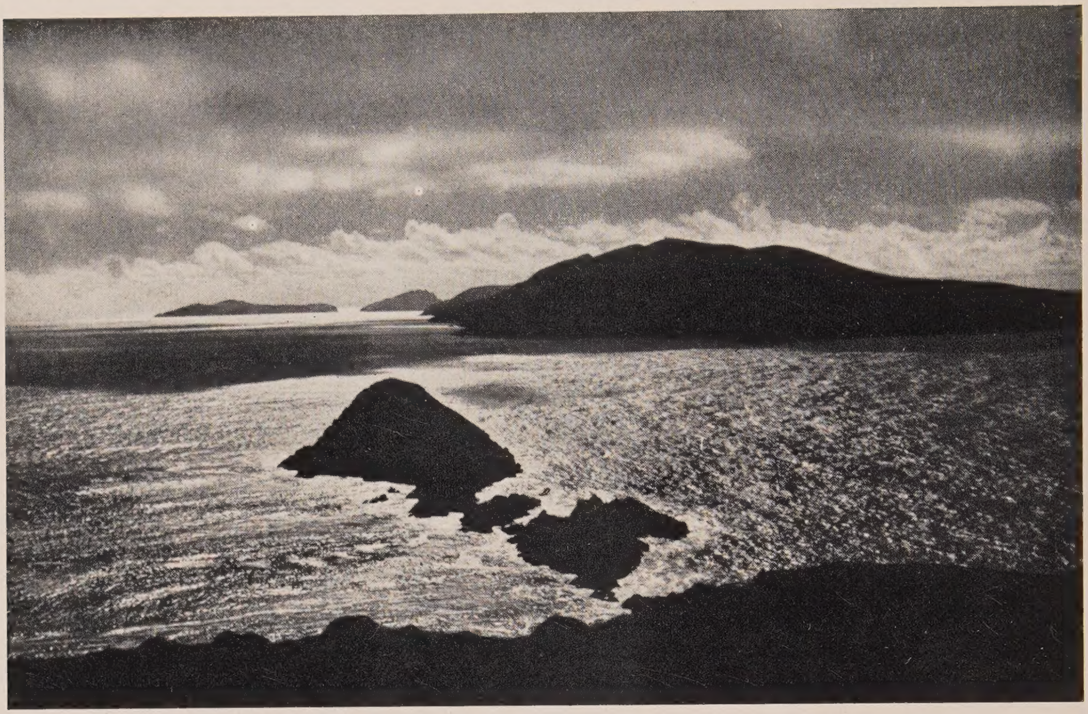
The last ascent towards the summit is rough and steep. Easy enough to peasant men and women, it is a severe penance to the old and infirm and those delicately nurtured in cities

From the slopes of the Reek a wonderful panorama is unfolded of Clew Bay and the distant, rounded hump of Mt Nephin

About the little chapel on the summit runs a pathway called the Great Enclosure, round which the pilgrims file in a never-ending stream, telling their rosaries aloud



Nearby is a curious mass of rocky stones, marked off with four iron stanchions, called St Patrick's Bed, from which they chip fragments of rock and take them home



Pilgrims come to Croagh Patrick from as far away as the Blasket Islands, the scene of that enchanting autobiography Twenty Years A'Growing *and the Mecca of students of traditional Irish lore*

there are a tiny chapel, built in 1905 of cement, and curiously drab in appearance; a pathway called the Great Enclosure, round which the pilgrims file in a never-ending stream, telling their rosaries aloud; and a curious mass of rocky stones, marked off with four iron stanchions, called St Patrick's Bed, from which they chip fragments of rock and take them home as souvenirs.

There is a sense of mystery in the spot. For the last 800 feet we have been in cloud. It swirls round the summit, now blotting out everything, now opening for a moment to reveal the chapel, the kneeling worshippers, a glimpse of a girl making her votive way painfully on her knees from the Second Station to St Patrick's Bed.

We do not stay long, for it is late. The stream is thinner as we descend. Most of the pilgrims are back in Westport, whence buses and trains will carry them home. There will be many sore feet, many stiff limbs and aching bones tomorrow. But on the mountain the pilgrims have found a communal reaffirmation of belief, both personal and national. Their pilgrimage has been more than a mortification of the flesh. It has been a strengthening of purpose, a replenishment in their daily lives.

Places and Products

VII. Jena Optical Instruments

by P. G. MOTT

In the application of scientific principles to technical practice, Germany's record is second to that of no other country; and at a time when Germans are displaying aspects of their national character less valuable to Germany or to mankind, we do well to remind ourselves of the characteristically German qualities that go to the making of the marvellous instruments associated with the name of Zeiss: thoroughness, persistence, accuracy and a strong sense of social obligation

It is not too much to say that today the name of Zeiss stands as the hallmark of quality in the sphere of optical instruments throughout the world. Yet the history of the Zeiss works is not widely known, nor is it realized by many that Ernst Abbe, and not Carl Zeiss, was really responsible for the origin and development of the largest optical manufacturing company in existence.

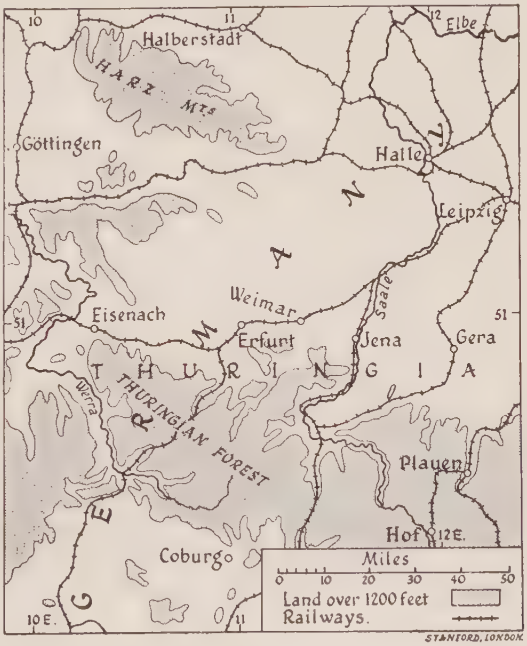
Carl Zeiss was born in 1816, the son of a toyshop proprietor in Weimar, that attractive little capital of Thuringia, so well known for its association with Goethe, Schiller, Liszt and Nietzsche.

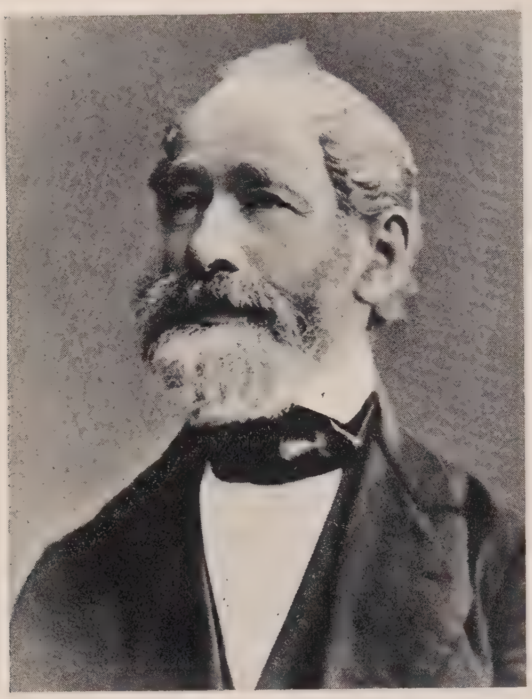
Twenty-four years later in Eisenach, another of Thuringia's historic towns, the wife of a cotton spinner gave birth to a boy, Ernst Abbe. As a child Abbe saw something of the social conditions of that time when factory operatives worked sixteen hours a day. The young Abbe and his sister used to take it in turns to carry their father's lunch to him, which he ate without interruption of his work. These early impressions of factory life were never forgotten by Abbe, and in later years he was to introduce social reforms of a revolutionary character into the structure of his own factory.

Abbe showed such promise in his early studies that, through the kindness of his father's employer, he was sent to a secondary school from which he matriculated to Jena University, and finally to Göttingen, where he studied mathematics and physics. At the age of twenty-one Abbe took his doctor's degree with an abstruse thesis on the Mechanical Equivalent of Heat.

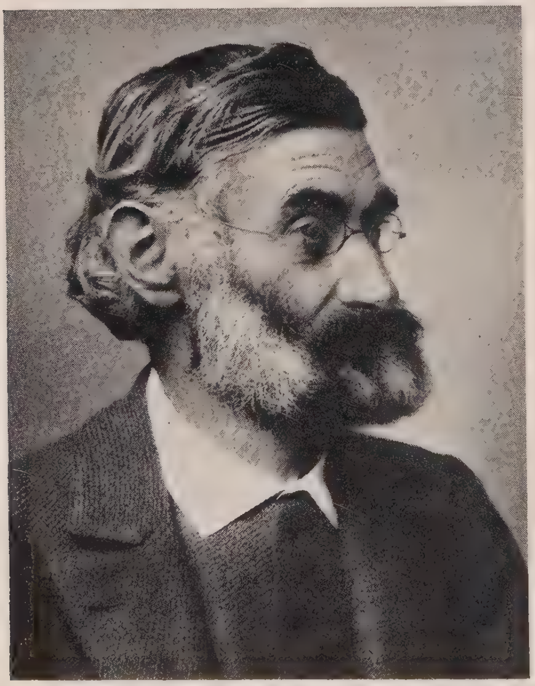
After a short stay as assistant in the Göttingen Observatory, and then at the Frankfurt Institute of Physics, Abbe returned to his old university at Jena, where he became a special instructor of physics, and seven years later was given a professorship.

Meanwhile Carl Zeiss in 1846 had also come to Jena, and set up a small business of his own as a fine mechanic. Abbe's first contact with Zeiss came about when, as a student, he went to the instrument maker in order to gain some practical experience, which was unobtainable at the University. Zeiss was only too pleased





Founders of the great Zeiss works: Carl Zeiss—



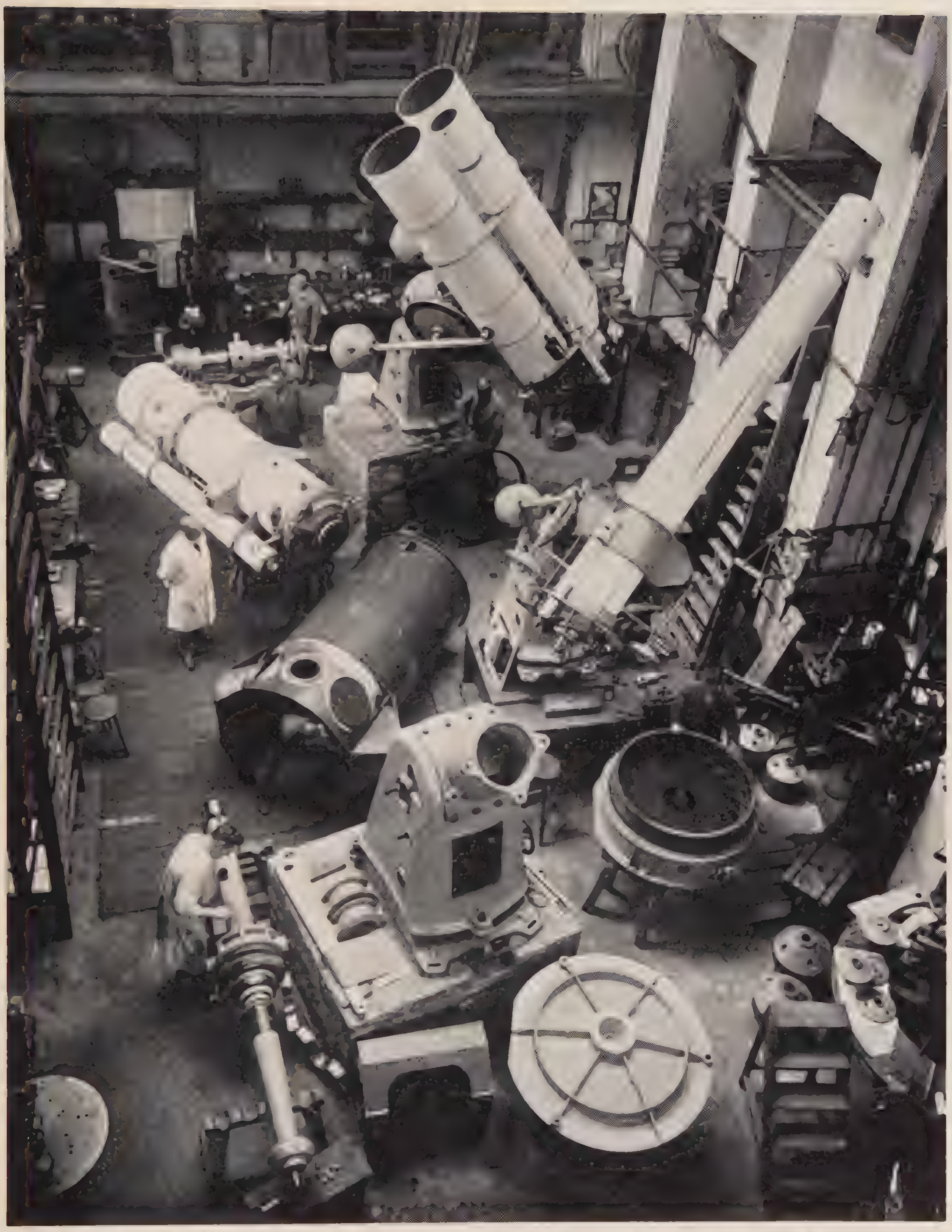
—the mechanic, and Ernst Abbe, the scientist

to let the young energetic student handle his lathes and help in the work of the shop, and so an initial friendship sprang up between these two men of widely different positions.

After Abbe's return to Jena in 1863 the contact with Zeiss was resumed. The instruments at the University laboratory were old and out of date, and there were frequent visits to the Zeiss workshop in which the master and the mechanic worked together in the construction of improved apparatus. More and more Carl Zeiss began to value the qualities of the young scientist, and to depend on his assistance.

At that time little was known about the theory of optics. Lenses were manufactured by a process of trial and error, and even with the best microscopes the images were poorly defined, with varying degrees of distortion, and marred by colour bands. Such lenses were useless for very intense magnification in bacteriological or astronomical work. Though lacking in any scientific training, Zeiss had sufficient practical experience and foresight to realize that the deficiences in his lenses would never be overcome until the fundamental principles of applied optics were fully understood. Obviously he himself had neither the education nor the brain for carrying out research of this kind, so he looked around for someone who had, and his choice, not unnaturally, fell on the doctor of physics at the university.

In the summer of 1876 Carl Zeiss and Ernst Abbe went into partnership. The initial and most serious problem that Abbe had to face was the difficulty of obtaining good glass. Glassmakers in Vienna and Munich were approached without success, so inquiries were made in Paris and Birmingham, but no one seemed capable of producing the chemically pure glass that was so essential to the improvement of lens production. In referring to these early difficulties, Abbe later wrote that he and Zeiss were driven into combining



All kinds of optical instruments are made at the Zeiss works, and for every corner of the world. In this assembly shop can be seen: a double telescope for the Brussels Observatory (background); a reflector telescope for Nanking (left); the long tube of a refractor for the Franklin Memorial Museum, Philadelphia (right); two large sections of a reflector telescope for Brussels (centre) their practical experiments with a kind of dream optics in which hypothetical glasses, existing only in their imaginations, made it possible for them to discuss the progress that could be achieved if only the proper raw materials were available.

At the propitious moment a third personality entered on the scene. Otto Schott, though only twenty-eight years of age, had already travelled widely and occupied positions as a research scientist in several chemical works. In 1879 Abbe received a letter from Schott asking his advice on some new kinds of glass containing lithium with which he was experimenting. The optical properties of this new lithium glass were unsuitable for Abbe's work, but the two scientists at once collaborated with the result that three years later Schott took up permanent residence in Jena, where he established a *Glastechnisches Laboratorium* in conjunction with Zeiss and Abbe.

With a grant of £3000 from the Prussian Ministry of Education, Schott's researches made rapid progress, and in 1884 a new firm known as Schott and Partner came into existence, the partner being Abbe.

The mechanic, the mathematician and the chemist were now united in a single purpose which has since given to mankind the science of applied optics and the limitless benefits of modern optical machinery.

After the advent of Schott, the firm of Zeiss made enormous strides forward. In 1877 thirty-six men were employed; in 1888, when Carl Zeiss died, there were 325 employees; while on the death of Abbe in 1905, the number had risen to 1550. Today there are 6000 employees in the Zeiss works proper, and a further 1700 at Schott and Partner.

At first only microscopes were built, but gradually the field of production widened until it now embraces every sort and kind of optical instrument. Microscopes, binoculars, photographic lenses, telescopes, geodetic and stereo-mapping instruments, precision instruments measuring one millionth of an inch, medical and therapeutic instruments, spectacles, searchlights and military instruments of all kinds, are some of the enormous variety of Zeiss products.

The precision and perfect workmanship of the Zeiss instruments have gained for the makers an almost legendary reputation. There is no mass production in this factory; indeed such a thing is impossible where lenses are concerned. No two 'pots' of glass are ever quite the same, even though they may be chemically identical. Only about 25 per cent of the glass delivered by Schott is actually used at the Zeiss factory, the rest being rejected. Glass often takes a very long time to cool, and some batches have to remain as long as eight months in the furnace. When the glass is at last ready to be worked, there is a special research department to find out the properties of every separate batch, so that the exact curvature can be given to the lenses that will correspond with the nature of the glass from which they are made. After rough grinding the lenses are polished to a minute degree of accuracy. Finally they are tested in special quartz moulds of supplementary curvature. If there is the slightest pocket of air between the mould and the lens, brilliant colour bands, known as 'Newton's Rings', are seen, and polishing must be resumed until these rings completely disappear.

Every single lens has to pass through the hands of thirty-five different operatives, and every prism through fifty. In some microscopes and other optical instruments there are as many as a dozen lenses and prisms so that it is not surprising that the cost of such apparatus is extremely high.

One of the most interesting sides of the Zeiss factory is that dealing with aerial survey. No other firm in the world has done as much for the advancement of photographic mapping as Zeiss. In 1931

The making of lenses. A circular 'saw', having diamond splinters for teeth, cuts the crude blocks of glass into exactly plane surfaces, while the operator examines the cuts with a microscope

The lenses are then polished by hand against a mould which revolves at great speed. The operator uses his fingers to keep the lens on the mould and immersed in the grinding solution. This work requires extreme accuracy

After further polishing, each lens is finally tested against a quartz mould of supplementary curvature. If, when lens and mould are pressed together, the brilliant colour bands known as 'Newton's Rings' appear, polishing must be resumed until these completely vanish

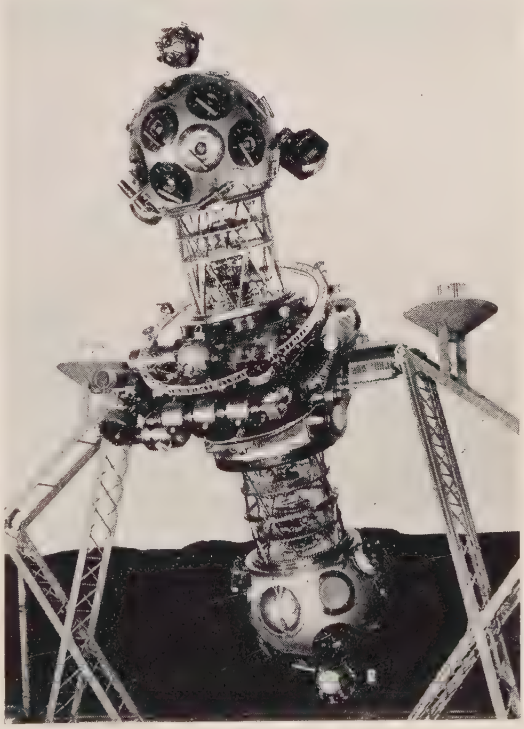
One of the most fascinating of all the Zeiss instruments is the planetarium, by means of which one can follow in the space of a few minutes all the astronomical changes which have taken place over many thousand years. On a domed roof, representing the celestial hemisphere—

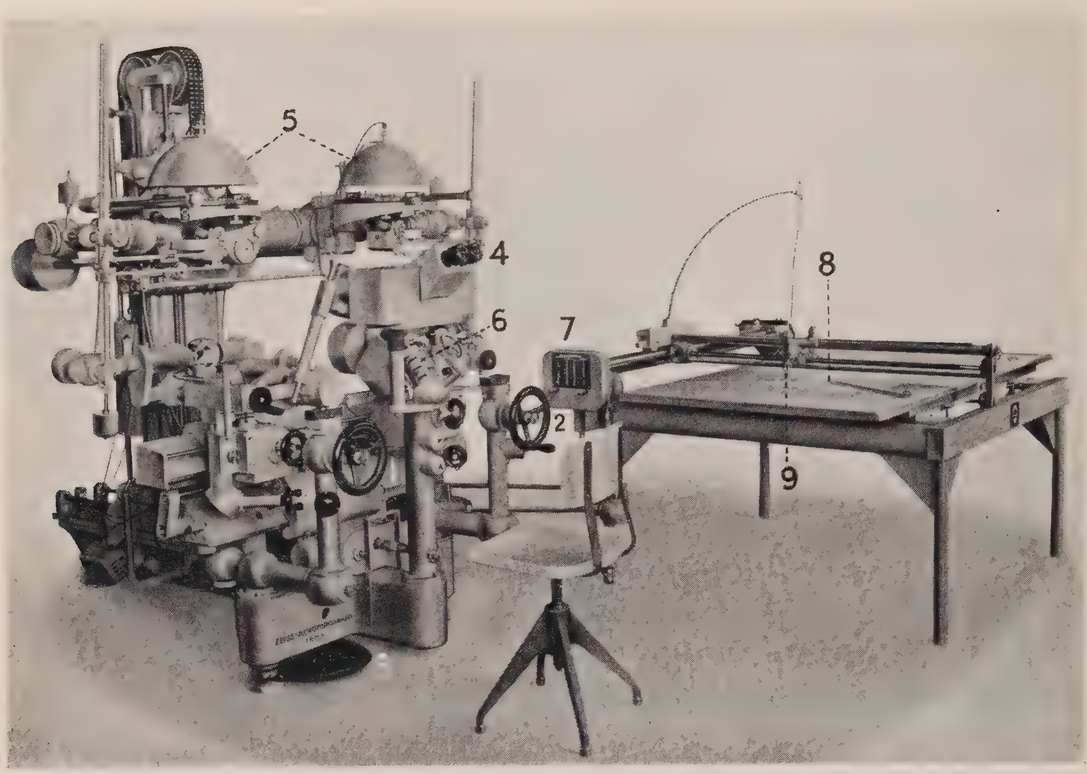
—the planetarium projects a model in miniature of the heavens, showing each constellation and planet behaving exactly as in the sky. With a luminous pointer the lecturer demonstrates any star he pleases

the Aerotopograph Company of Dresden amalgamated with Zeiss and moved their premises to Jena. Zeiss-Aerotopograph, as the new concern is known, now combines the fruit of thirty years of research carried out by two great companies. One has only to walk round the large demonstration room to gauge the astonishing progress made in aerial survey. There are automatic cameras that fit into the fuselage of an aeroplane. The cameras are driven by an electric motor which ensures that successive overlapping photographs are taken at the correct intervals, while the aeroplane flies a straight and level course. The lenses required for these cameras must be absolutely free from any distortion even at the edges, while the area of country embraced by each photograph must be the largest possible within practical limitations. Zeiss have now perfected an extra wide-angle lens with an angular field of 95 degrees and a focal length of 8 inches. This means that a single photograph taken by a camera fitted with this lens at a flying height of 10,000 feet includes an area of approximately eight square miles on the ground.

Most ingenious and fascinating of all are the stereoscopic plotting machines for making maps from the aerial photographs. The most elaborate of these—the Zeiss Stereoplanigraph—can make use of any kind of aerial or terrestrial photograph taken with a survey camera. The photographs are inserted in the machine (which looks rather like one of the 'things' in H. G. Wells' *Things to Come*) in stereoscopic pairs, so that, when viewed through the binoculars in the front of the apparatus, a small part of the landscape is seen as it appeared to an observer sitting in the cockpit of the aeroplane, but with the difference that the prominent features on the ground stand out in exaggerated relief. There is a 'floating mark' that can be moved about the picture by operating hand and foot wheels on the instrument, and by making this mark follow round any particular feature in the landscape an exact plan (or contour) of the feature is produced to a reduced scale on a drawing-board mechanically attached to the instrument. Some idea of the almost incredible accuracy of these machines may be gauged by the fact that, from aerial photographs taken at 4000 feet, contours of five metres have been drawn. In spite of the enormous costs of these plotting machines, there are already eighty in use in different parts of the world. It is a matter for considerable regret that no such apparatus exists in this country or even in the British Empire, since no British firm has been able to produce more than the crudest approach to this wonder of German ingenuity.

Something has been said of the remarkable production side of the Zeiss factory, but only a passing mention has so far been

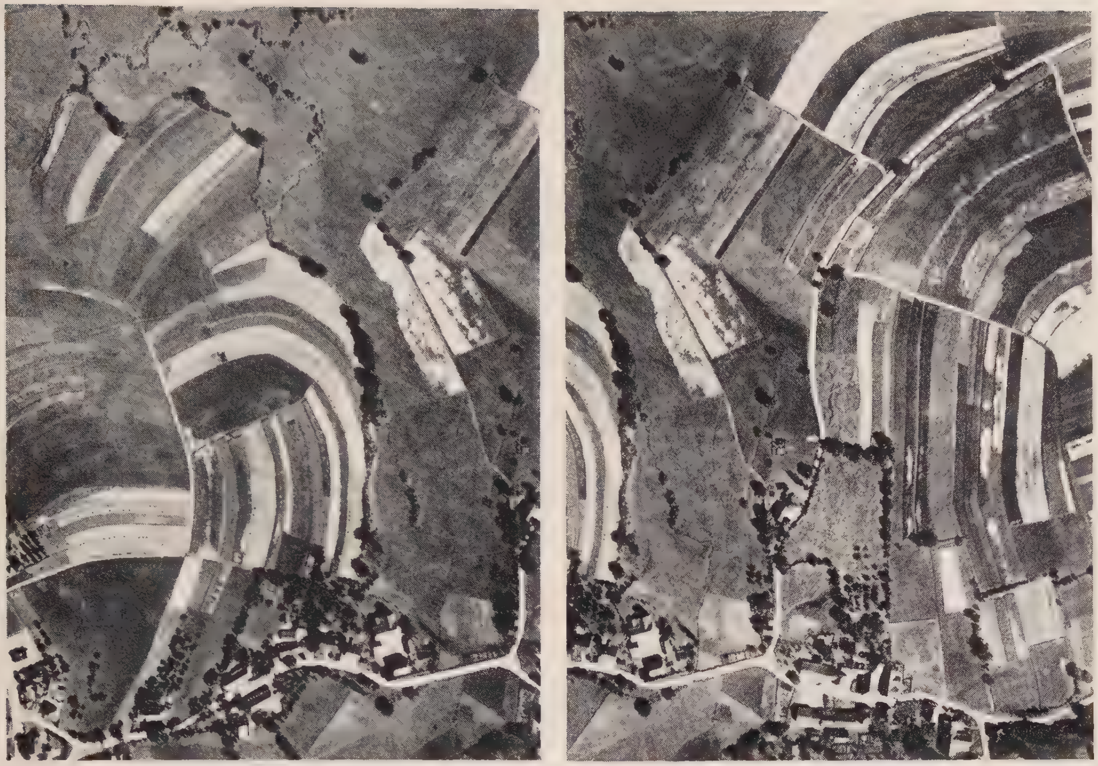

The planetarium, 16 feet high, contains 39 lenses and 104 image projectors; by manipulation of the lights inside it every heavenly body and every astronomical phenomenon can be imitated



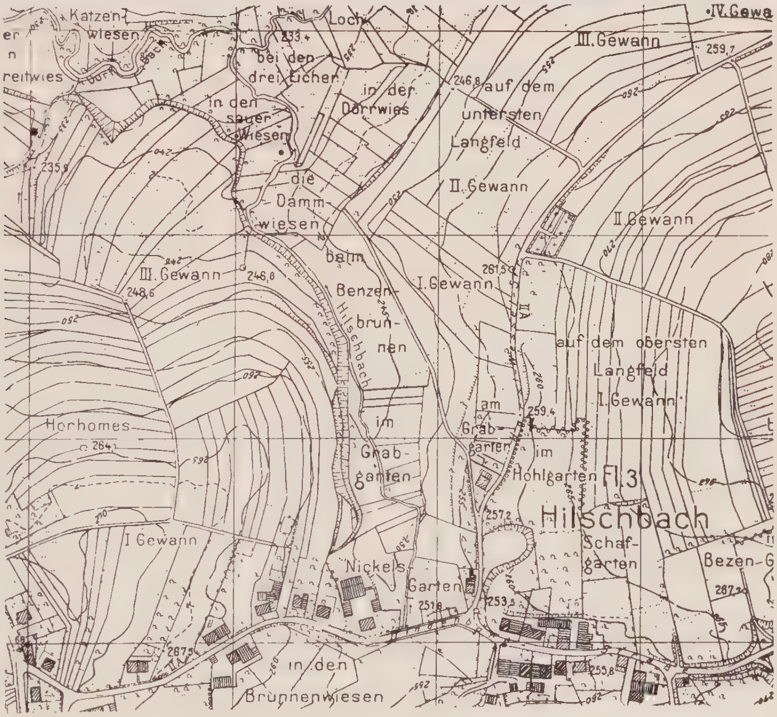
THE ZEISS STEREOPLANIGRAPH

When a landscape is photographed from two different camera stations the light rays from individual points in the terrain pass through the objectives of the cameras and produce image-points on the sensitized surface of the plates (or films). In the Stereoplanigraph this process is reversed. After leaving the illuminated image-points, the light rays pass through the projection systems of two cameras and produce a scale model in relief of the landscape. A 'floating' mark is made to run over this stereoscopic model, and the resulting tracing movements of the mark are automatically registered on a drawing-table, while the vertical movements of the mark are recorded on an altitude counter.

1. Handwheel for operating longitudinal movement of tracing-mark (x direction)
2. Handwheel for operating transverse movement of tracing-mark (y direction)
3. Footwheel for changing height of measuring-mark (z direction)
4. Binoculars for viewing stereoscopic model
5. Illuminating lamps over photographs
6. Altitude counter
7. Gear ratio—plotting machine : drawing-table
8. Drawing-table
9. Drawing-pencil



(Above) *Two air photographs taken for mapping with the Stereoplanigraph. The stereoscopic effect results from their overlapping: it will be seen that the right-hand half of the first photograph is repeated in the left-hand of the second.* (Right) *A section of the finished map covering the whole area of both photographs*



made of the unique social system under which the firm is managed, and for which Abbe was responsible. Let us return to the later history of the works.

After the death of Carl Zeiss in 1888, Abbe found himself in partnership with the son, Dr Roderick Zeiss. Unlike his father, Roderick Zeiss had little ambition, and was content to live on the very fair profits that a flourishing business brought in. Abbe's active brain, however, was not content to let well alone, and he was anxious to develop and enlarge the scope of the works. One day Abbe wrote to the younger Zeiss with an offer to buy him out of the business. Zeiss accepted, and Abbe became the sole owner.

Unlike many who have achieved riches after extreme poverty, Abbe's early struggle left him untouched by bitterness, but it instilled into him a deep-rooted desire to use his acquired fortune in bettering the working conditions of those who had assisted him in building up his position. Far from any idea of philanthropic indulgence, Abbe realized that one of the great maxims of life, 'He who gives most, will also get most', applied just as much to industrial labour as any other form of service. His idea was to create in every single one of his employees an interest and pride in the development of the works, and he knew that the surest way to do this was to make every workman a shareholder in the business. But Abbe went much further than that. He determined so to arrange things that every man, no matter what his status in the factory, was mentally and physically cared for. Such ideas were far ahead of his time, and it was not at first clear to Abbe how he could best put them into action. He decided on a drastic course.

In 1891 Abbe surrendered the whole of his fortune and rights in the works in favour of the Carl Zeiss Foundation, which he named after his old colleague, and which exists to this day. Under the statutes of the Foundation a share of the profits each year is divided among the workers in proportion to their salaries. The rest of the profits go to swell a general fund that is used to provide a pension for aged workers, medical help for the sick, grants for building loans to enable workers to own their homes, and for new equipment and improvements to the factory.

In 1900 Abbe introduced the eight-hour day, and it is a recognized part of the system that every employee enjoys three weeks' holiday in the year. Shareholders and dividends do not exist, for the whole of the capital is owned by the Foundation. In 1919 Otto Schott followed the example of his late partner, and added his share of the glass-works to the Foundation. The Foundation is managed by a Board of Directors who are the only ones in the firm that are exempted from the profit bonus. By this ingenious arrangement the managing board has an interest in making the standard of wages as high as possible, while a further limit is put to their salaries which may in no case exceed ten times the average earnings of all workers over a certain age.

Socially and materially there exists in Jena today an industrial organization of unchallenged perfection that stands as a magnificent memorial to the guiding genius who engendered it.

A Hundred Years of British Farming

by Professor J. A. SCOTT WATSON, M.C.

Many, probably most, readers of The Geographical Magazine *are townsfolk who lack first-hand acquaintance with the problems of the countryside and regard it mainly as a place for recreation. To them, on the occasion of a notable agricultural centenary, we commend the following account of the British farmer's achievements and difficulties during the past hundred years. The author is Professor of Rural Economy in the University of Oxford*

In July of this year the Royal Agricultural Society of England has been celebrating its centenary by the holding, in the King's Great Park at Windsor, of the largest and finest Agricultural Show ever seen in Britain.

Ever since its foundation the Society has published a Journal, and its ninety-nine annual volumes record, year by year, the progress and the vicissitudes of English farming—the scientific discoveries and the mechanical inventions that have helped the farmer to produce cheaper and better food; the economic changes which have obliged him, from time to time, to redirect his efforts; and the measures which Governments have taken to regulate and to encourage the country's oldest industry.

It would be a mistake to suppose that farming in England was in a primitive state a hundred years ago. In fact Britain was at that time, and continued to be for another fifty years, the world's shining example of agricultural progress. The need for better farming had begun with the Industrial Revolution, and had increased with the rapid growth of the country's population. In 1760, when George III came to the throne, the population of England and Wales is supposed to have been about seven millions; in 1801, when the first census was taken, it was ten and a half millions and in 1839 it exceeded sixteen millions. As yet only a little food was imported, and even in 1850 it was estimated that the country was producing seven-eighths of its requirements of wheat. It is obvious that great efforts had been called for in order that the growing numbers of mouths should be fed, and 'the hungry forties' is a phrase that indicates the difficulties that had been met. Year by year the town dwellers of these times followed anxiously the progress of the farmer's crops, knowing only too well that a bad harvest would mean a scarcity of bread.

Improved transport had already eased the problem of bringing food from the farms to the new towns; long stretches of canals had been made; Telford and Macadam had built their bridges and their roads, and the newly improved stage coach service could bring a passenger from Liverpool to London in 42 hours. Steam coasters were already bringing Aberdeenshire beef to London citizens; the London-Birmingham Railway was opened in the same year that the Royal Agricultural Society was founded. Perishable foods, however, could not be carried far; market gardeners clustered close round the skirts of the towns, and most of London's milk was produced in city cowsheds, the cattle fodder being brought on wagons from nearby farms.

Up till 1839 the progress of agriculture had depended almost entirely upon the farmer's own efforts, for there was no underlying basis of science; no chemist could explain the action of manures; no veterinarian understood the causes of animal disease; no botanist could suggest a scientific method for the improvement

A hundred years ago the British farmer used oxen for ploughing, as did his Anglo-Saxon ancestors

The harvest field still presented the ancient picture of reapers cutting the corn with sickles

The grain that fed a population which had more than doubled itself in eighty years, was, in many places, separated from the ear on the threshing-floor by beating with the wooden flail

Rischgitz Studios

of plants. But the dawn of agricultural science was at hand. The great German chemist Liebig had already applied his mind to the mysteries of plant nutrition and soil fertility, and John Bennet Lawes had already started, at Rothamsted in Hertfordshire, what was to become the greatest agricultural experimental station in the world. It was largely in the belief that scientific knowledge was destined to play a great rôle in farming progress that the Royal Agricultural Society was founded. Its motto is 'Practice with Science'.

The stage of progress that British farming had attained, in 1839, varied greatly from district to district. The most spectacular revolution had been the introduction of a completely new system on the lighter soils in the eastern half of the country, where wide stretches of poor sheep-walks had been converted into good corn land. Such areas were the poor sandy lands of West Norfolk, where Coke of Holkham first showed the way; the heaths and wolds of Lincolnshire; the Yorkshire Wolds; and the moorlands of the North and of Scotland. A complete technique of reclamation had been worked out. Most of the land was acid, and required heavy dressings of lime. Most was deficient in phosphate (though the farmer of those days would not have understood the meaning of the word) and gave an extraordinary response to applications of bones. When a basis of fertility had thus been obtained the clover and the turnips, which had been introduced from Flanders, could thrive, and large flocks of sheep and herds of cattle could be maintained. Their manure, in turn, enabled the land to produce good crops of corn.

By contrast, but little progress had been made in wide areas of the Midlands where the soil was heavy clay. Here turnips were a precarious and costly crop and the land in winter was too wet and sticky to benefit from the 'golden hoof' of the sheep. Here too the lack of any efficient system of field drainage was a great bar to the increase in the productivity of the soil. For the most part the land was still lying in steeply-set-up ridges with furrows between to carry off the winter rain. A costly and wasteful summer fallow was the only satisfactory preparation for wheat. Even with wheat at fifty or sixty shillings a quarter, and with workers' wages at ten shillings a week, the clay-land farmer had a hard enough task to make a profit.

The implements of husbandry were still few and simple. Ploughs, harrows and drills were good or bad according to the skill of the local blacksmith and wheelwright. Corn was still reaped with the sickle or mown with the scythe, and the only notable labour-saving machine was the thresher, still rather primitive in form. The 'threshing machine riots' and the rick-burnings of 1830–31 mark the period when machinery was being widely substituted for the flail on the large corn farms of the southern and eastern counties. The small farmer still threshed in the old way.

In 1839 farming was well on the way to recovery after the long depression which had followed the Napoleonic wars. The Poor-Law Amendment Act of 1834 had put an end to a system of relief that had demoralized a whole generation of workers. The Tithe Commutation Act of 1836 had not, indeed, as was fondly hoped at the time, settled for good and all the thorny question of tithe; but it had substituted a stabilized money payment for the old rendering of the tenth sheaf, and had thus removed one of the brakes upon the farmers' enterprise.

The emphasis in farming was upon corn, and especially upon wheat. The best estimates of the time show that the total grain acreage was nearly double that of today. What is now the most important branch of our farming—milk production—occupied a very minor place in the scheme of things. It is thus not surprising that the political question of the day which touched the farmers most nearly was the future

By courtesy of John Fowler & Co.

A great advance in ploughing was John Fowler's steam tackle, which received recognition in 1858

of the Corn Laws. Cobden's Anti-Corn Law League was founded in the same year as the Royal Agricultural Society, and the withdrawal of the fiscal protection which the farmer had so long enjoyed hung like a black cloud on his horizon. Another decade was to pass before Free Trade won the day and, even then, farmers were to find that their immediate fears were groundless. Population continued to keep pace with food supplies; there were great difficulties to be overcome before the fertility of the American prairies could be delivered to English towns in the form of bread. The Repeal of the Corn Laws was a delayed-action bomb which did not explode for thirty years.

Let us now trace out a few of the more important lines of development of the century.

MECHANIZATION

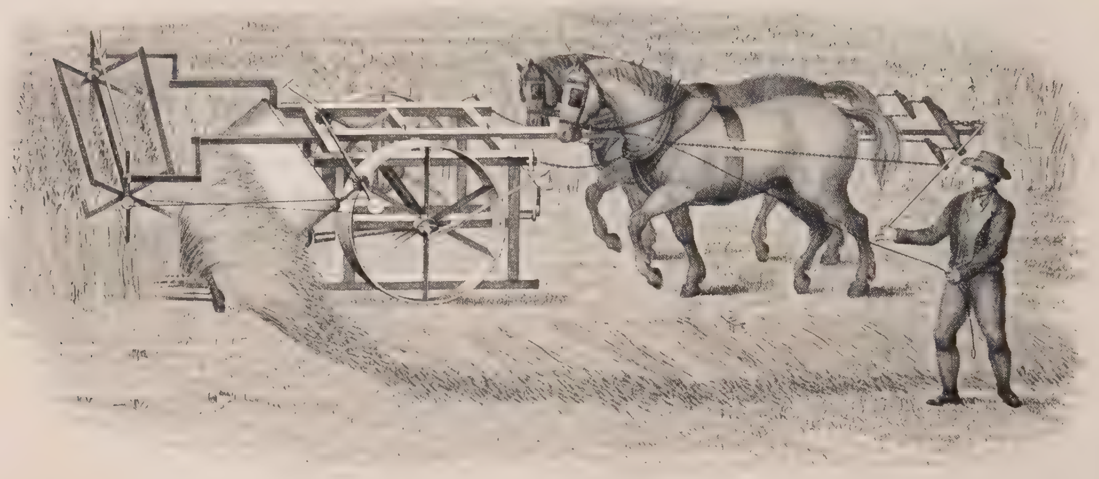
In every industry there is a constant urge to increase the productivity of labour and, in most, the chief means to this end is the discovery of mechanical substitutes for the strength of human bodies and the skill of human hands. Farming is no exception to the rule. Some of its simpler tools, like the plough and the harrow, date from remote prehistoric time. The grain drill was an early 18th-century invention; the first tolerably efficient threshing machine was built in 1785. The problem of mechanical reaping had exercised men's minds from about the same time, and what was almost the solution had been achieved by Patrick Bell, a Scottish country parson, in 1828.

The first notable invention after 1839 had to do with the problem of the drainage of the clay soils. It was seen that a system of underground channels must have many advantages over one of surface drains, and, in districts where stone was readily available, stone conduits began to be generally used in the 'thirties. In clay-land districts bricks or hand-made tiles were employed instead, but it was obvious that a great saving in cost would be achieved if only a machine could be made to turn out a hollow tube of clay, which could bear the stress of handling and burning in a kiln. Such a machine was invented by Scragg in 1845. The Government of the day decided to encourage the drainage of the land by means of long-term loans, and during the late 'forties and the 'fifties an immense amount of drainage was carried through, partly by such direct Government assistance, partly with the help of bodies like the Lands Improvement Company and partly by the joint efforts of landlords and tenants themselves.

Between 1850 and 1865 the greatest object of the agricultural engineer was to adapt the steam engine for the purposes of agriculture. The early engines were of the 'portable' type, *i.e.* they were mounted on wheels, but had to be drawn from farm to farm, or from field to field, by teams of horses—'like a steamer being towed by a sailing ship'. It was a comparatively easy task to build an engine which could be towed along a farm lane, followed by the portable thresher which it was designed to drive, and thus to obtain a substitute for the flail even on the smaller farms. It was a more difficult task to yoke the 'steamer' to a plough or a cultivator. When traction engines were invented the first notion was to use the engine as a tractor, but the relationship between its weight and its power proved an insuperable obstacle. It can readily be imagined that the passage of a ten-ton engine did no good to the soil; moreover the engine used up the greater part of its power in moving itself over the field. The solution of the problem, so far as it was solved at the time, was to make the engine work a windlass, and thus to pull the tillage implement by means of a wire rope. The Royal Agricultural Society offered a £500 prize for an efficient steam-ploughing tackle and the award was made to John Fowler, of Leeds, in 1858. Thereafter steam tillage made considerable progress. The big farmer on heavy land bought his own equipment, for the times were prosperous and there were profits to invest. The small farmers subscribed to steam-ploughing companies, or hired the sets which contractors had acquired. It was generally felt that tile drainage and steam ploughing would do for the clay-land farmer what turnips, clover and sheep had done for his opposite number on light soil—would vastly increase the output of the land; but this hope was never fully realized. The 'steamer' could help, but it could not displace the horse.

Farmer and Stockbreeder

The modern farmer uses machinery to the full, if he can afford it. A good tractor, with a four-furrow plough, can turn over five or six times as much land in a day as a team of horses

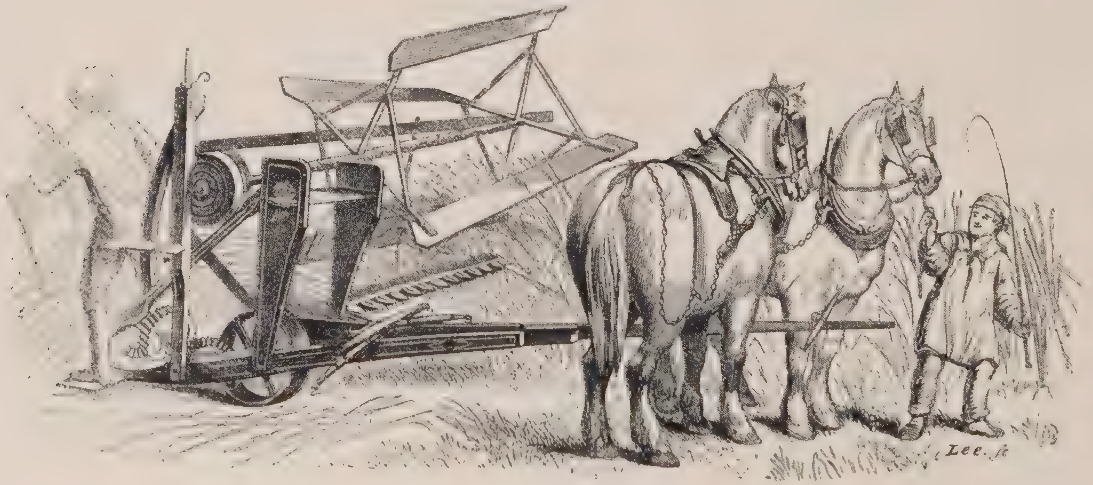


By courtesy of the Royal Agricultural Society

The problem of mechanical reaping was almost solved by the machine invented by Bell in 1828

Meanwhile, in 1851, there had been held in London the first great International Exhibition, and immense interest was aroused throughout agricultural England by the appearance of two American reaping machines. A trial of these was arranged in Essex, and the quality of their work astonished the multitude of farmers who saw it. Four British firms undertook the manufacture of the American models, and within a year had received orders for 1400 machines.

This was only one stage in the development of corn-harvesting machinery, for the early reapers left the cut corn lying loose upon the ground. Another thirty years of effort, both in this country and the United States, was required to devise a mechanism that would gather and tie the corn into sheaves. Some of the earlier machines used wire for binding; the first effective string binder, with a knotter, appeared in this country in 1881. An invention of such importance was bound



By courtesy of the Royal Agricultural Society

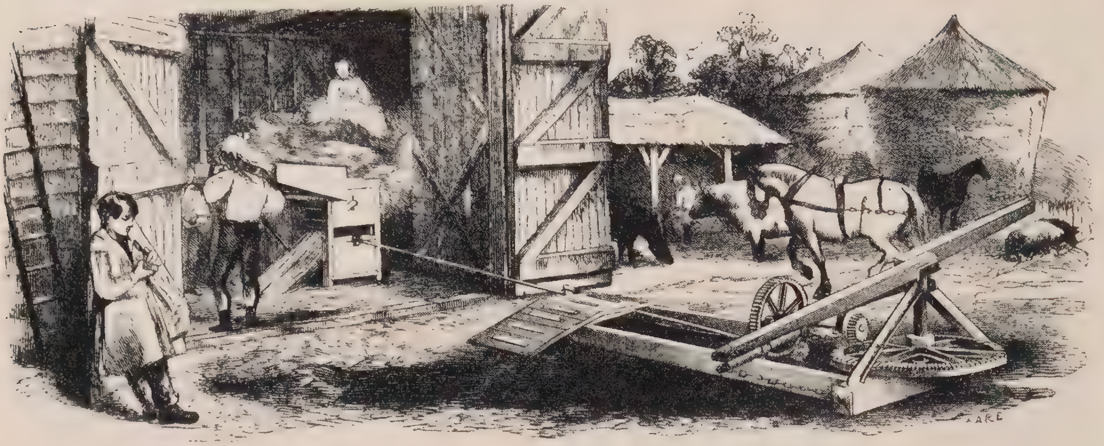
The first really efficient reapers were American: McCormick's, shown at the Great Exhibition of 1851

Guy & Collier

Reaping on an upland farm. In the background is a combine-harvester at work. It reaps and threshes simultaneously, and the grain is ready for market within a few hours of cutting

to affect unequally the farming of different countries. The binder is still a doubtful economy on the small peasant farms of some continental countries where labour is very cheap; but Appleby's Knotter was the key which unlocked the fertility of the prairie lands and, incidentally, made many British farmers turn reluctantly from the plough and wheat to grass and cows. The crisis in British corn farming came in the early 'nineties; many once-prosperous farming families disappeared from the land; many clay farms in Essex were left tenantless until a new supply of farmers could be imported. These, when they came, were mostly hard-bitten Scotsmen, bred on the little upland dairy farms, who worked like slaves, lived in the kitchens of the great old farmhouses and turned the old arable fields into pastures for producing London's milk.

The first hint of a complete solution of the old problem of power tillage came in 1903 when Daniel Albone, of the Ivel Cycle Works, Biggleswade, exhibited an 'Agricultural Motor' at the Royal Show. It took many more years to make tractors sufficiently dependable to be of general use. Only a few were to be seen in England before the Great War and when, in 1917, the urgency of the food situation demanded a great increase in our corn area, the necessary tractors had to be brought from America. In recent years rising wages have brought a great urge to mechanization, for a man with a modern tractor can plough six acres in a day instead of one acre with a team of horses.



By courtesy of the Royal Agricultural Society

An important innovation in the rickyard of 1845 was Barrett, Exall and Andrewes' two-horse threshing machine, described as 'most conveniently portable, with an average performance of fifteen quarters per day'

In twenty years the number of work-horses on farms has declined by a quarter of a million.

Recent years have seen many other developments. We have combine-harvesters which cut and thresh the corn in one operation, and grain driers to prevent the loss which wet harvests occasion; our large dairy farmers use mechanical milkers; the pioneers who dry their grass by artificial heat, instead of trusting to our fickle sun, now number over a hundred. We have machines to plant our cabbages and water them in. We can now make a fence with a single electrically-charged wire in place of 'four plain and one barbed'. But a long list of problems remains. Our root area is steadily shrinking for lack of some substitute for a hand hoe; our sugar beet must still be got out of the muddy autumn soil at the cost of many numbed fingers and aching backs; potato harvest still requires twenty pairs of hands to clear the land at the rate of a paltry three acres a day.

FEEDING THE PLANT

It was not an Englishman, but a German, who made the first real contribution to the science of plant nutrition. In 1840 Baron Liebig wrote a famous report to the British Association on the application of chemistry to agriculture. He showed that the bulk of the substance of the plant comes not from the soil but from the carbon dioxide of the air. He also showed that the plant takes certain substances—like lime, phosphates, potash and nitrogen—from the soil; that some notion of the plant's requirements may be obtained by analysing the plant itself; and that a shortage of any one vital requirement, such as potash or phosphate, sets a limit to the yield of the crop. It remained to try out Liebig's theory in the field, and this was the object of the field experiments which Lawes and Gilbert began at Rothamsted. The results were brilliant. The long-known fertilizing value of bones was explained as due to their content of phosphate; and when the supply of bones became quite inadequate, chemists were able to find substitutes in the form of rock phosphates and basic slag. Lawes made a fortune out of his process for increasing the solubility of phosphates by treating the latter with acid, and used a large share of his money to build up and endow the Rothamsted Experimental Station. Up till the 'seventies the only potash fertilizers were obtained, from wood ashes and seaweed, by laborious and costly methods; but after that time abundant supplies became available from deposits in Germany.

The mystery of the soil-enriching properties of clover and other leguminous crops was solved in 1889, but the farmer now needed a speedier and more controllable method of supplying the nitrogen needs of the non-leguminous plant. Peruvian guano and Chilean nitrate were brought to Europe in large quantities, and a process for the recovery of ammonia from coal-gas added to the supplies. But in the 'nineties it was obvious that all the available supplies of nitrogen fertilizers were certain to fall short of the farmers' needs. Sir William Crookes, in a famous address to the British Association, pointed out that the world's supply of wheat was being maintained only at the cost of depleting the fertility of the world's soils and that, if famine was to be averted, the chemist must find a way of turning the nitrogen of the air into manure for the farmers' fields. The chemist rose to the occasion and invented no less than three separate processes for the purpose. A growing proportion of our nitrogen fertilizers is now made synthetically from the air.

Here again many gaps in our knowledge remain to be filled. For instance we still do not fully understand all the complex living processes that go on in the surface layer of the earth, or the dependence of our crop plants or upon the other forms of soil life. We know that various organic

The Times

During the 19th century the introduction of steam-threshing greatly accelerated the conclusion of the harvest. A much more recent amenity is the pneumatic tyre, used on all kinds of farm vehicles

By courtesy of the Royal Agricultural Society

The art of the stockbreeder, in which Britain has excelled for nearly 200 years, had already reached a high level in 1841, when Jonas Webb was painted with his Southdowns

Sport & General

The Southdown type maintains its popularity: a fine pen of shearling ewes at Chichester

By courtesy of the Smithfield Club

A potent influence in promoting the standard of beef cattle has been the Smithfield Club, whose exhibition of fat beasts at the Horse Bazaar, Baker Street, in 1839, is shown here

Fox Photos

Hereford bulls have improved meat herds all over the world, notably in the Argentine

Rischgitz Studios

Milk supply in the 1840's was a haphazard affair. The milkmaid served her customer straight from the cow: transport was difficult, and cows were kept even in the heart of London

substances, in decayed plant material and in animals excretions, have important influences on our crops, but we still only partially understand the reasons.

PLANT AND ANIMAL IMPROVEMENT

If bread is to be good and cheap we must not only know how to feed and grow the wheat plant; the plant itself must be one that is capable of responding, with a generous yield of good flour, to our skill. Similarly, in producing milk it is important that the cow should be well fed and well managed; but it is equally important to have a good cow. All living things are variable and it is one of the oldest concerns of the farmer to pick out, and to preserve for breeding, the best of the many individual plants and animals that he grows. He may also cross one type of plant or animal with another, in order to obtain a wider range of variation and the possibility of better combinations of good qualities.

In the early days the farmer generally relied upon happy accidents to provide the material for selection; the wheat plant itself began as an accidental hybrid, and the successive steps in changing the hairy coat of the wild sheep to the fine wool of a modern Merino have been achieved because sheep-breeders, over some seven or eight thousand years, have been on the watch for Nature's happy accidents.

Darwin and Mendel gave the world a new understanding of variation and heredity, and the affair of improving our living material has gradually become a systematic business. Seedsmen employ scientists to produce better strains of plants; Cambridge University breeds better wheats and barleys, while Aberystwyth is performing the same function for our long-neglected grasses and clovers. Milk-recording Societies and Pig-recording Societies help the farmer to base his selection on definite facts and figures instead, as was formerly the practice, upon vague and doubtful inference.

There is no finality in this business of breeding. It is not only that variation knows no end, but requirements change. The large joints of beef or mutton of the sort that our grandfathers carved for their large progenies are today a drug on the market; lettuces must be invented which will grow crisp and full under artificial heat in the dull days of winter; hardy and unexacting old varieties of apples must be replaced with fastidious and difficult sorts like Cox's Orange, which have to be winter washed, summer sprayed and generally nursed like weakly children.

THE LAND AND THE NATION

The interest of the people in its agriculture has been subject to many changes in the past century. In 1839 the assurance of a home supply of food was still the vital consideration, and the farmer was encouraged by fiscal protection to increase the produce of the land. After a long controversy the policy was reversed in 1848; the notion of anything approaching self-sufficiency was abandoned, and free imports of corn were allowed. In the main, the farmer was left to his own resources from this time until the Great War. In the interval, indeed, the position of the tenant farmer was improved by a long series of Agricultural Holdings Acts, the object of which was to give the good

Mechanization now directly links cow and consumer. On up-to-date farms the cows are milked mechanically; the milk is then cooled, and bottled or put into containers for distributor or factory tenant security in his holding, to ensure that he paid no more than a fair and reasonable rent, to give him reasonable freedom in his choice of crops and the disposal of his produce and, finally, to give him the right of compensation, at the end of his tenancy, for any lasting improvements that he might have made in his farm.

A sudden change in the attitude of the State towards the land came in 1917, when the country was brought to the verge of famine. The farmer was compelled to farm in the interests of the State. He ploughed out, often willingly but sometimes under compulsion, two million acres of pasture in order to supply bread and potatoes. He was obliged to slaughter pigs and fowls because his supplies of feeding stuffs were strictly controlled to small quantities. His labour force was sadly depleted, despite the army of gallant land girls who came to his rescue. As a recognition of his services he was given, at the end of the war, guaranteed prices for wheat and oats, but the ink of the Statute Book was hardly dry when the Corn Production Act was repealed. .

Since that time the British farmer, like his opposite numbers in the Dominions and elsewhere, has been struggling under great difficulties. Wages have had to be progressively raised in conformity with those of other industries, and the wage level is now about two and a half times as high as that which prevailed before the war; meantime the general level of the prices of farm produce is no more than one third higher than that of 1913.

The efforts of the State to help the farmer to save himself began in 1931 with the passing of Dr Addison's Agricultural Marketing Act, which permitted farmers to combine for the purpose of controlling supplies and regulating prices. Under this act and its successors farmers have set up their Marketing Boards—sometimes with noteworthy and indisputable success, sometimes with but moderate effect. Reorganization of marketing has, however, at the best, proved only a partial solution, for the policy of other nations has led to excessive competition in the British market; certain countries have barred their doors to food imports, and the food-exporting countries have been obliged to unload their surpluses where they could, keeping their farmers in business by various forms of subsidy. The British farmer, of course, has obtained subsidies also—on wheat, on beef and other things; he is being encouraged to maintain the fertility of his land by government assistance in the purchase of fertilizers, and by grants for the ploughing up and re-making of his poorer pastures. Despite all this there has been a great loss of farm capital, and the industry now carries a very heavy burden of debt. The hopeful fact, today, is that the townsman has a growing interest in the nation's land.

THEN AND NOW

One could draw many contrasts between a farm of 1839 and 1939. The kinds of things that are produced have changed. The corn fields are fewer by nearly half, while the pastures are much more extensive. Tractors and pairs of horses do the field work that used to be accomplished with teams of four oxen and horses. The farmer's implement shed has grown from a small hovel to a long building of corrugated iron wherein are tools and machines of bigger size and vastly increased variety. Specialization has increased—we have poultry farms, fruit farms, market gardens and glasshouse farms. Crops are better than they used to be; wheat, for instance, averages thirty-two bushels instead of twenty-two. Livestock is better bred and better fed; probably the output of milk from an average modern cow (seven hundred gallons a year) is twice as high as that of her twentieth great-grandmother.

And what of the men who carry on the

Fox Photos

There are 250,000 fewer horses working on British farms today than in 1919

Victoria & Albert Museum

A moment that must recur while man survives: Harvest Home (from an old Liverpool jug)

work? The owner of a few thousand acres in 1839 was a rich man. Thirty or forty years later he was very rich. But rent rolls have shrunk greatly and progressively since the 'seventies, while the cost of estate maintenance has greatly risen since 1914, and taxation and death duties have taken an increasing proportion of the smaller income. The landowner today, if he has no other source of income than the land, is generally a poor man—so poor, in many cases, that he is no longer able to play his traditional part: that of keeping the equipment of the land up to the farmer's requirements. It is this, rather than anything based upon political theory, that is the main argument for the nationalization of the land.

The farmer of 1839 lived plainly but in fair comfort, drove his nag or rode his cob, and was looking forward with the hope of prosperous times. Prosperity came, and reached a peak in the late 'sixties and early 'seventies. The tenant of five hundred acres could live nearly as well as the squire. If he spent his income he might hunt two days a week, drive his carriage-and-pair and enjoy his glass of port. His descendant of this generation is generally working hard and living bare and, even so, is dependent upon his bank for the working capital of the farm. Perhaps he is no worse off than farmers in other countries. The depression is world-wide.

The number of workers on the land is far less than it was a hundred years ago. Agriculture now provides jobs for only one in sixteen of the country's workers. The land worker is still poorly paid by comparison with the men of equal skill and training who are employed in other industries; but the discrepancy is less than it used to be. And the modern farm worker is certainly well off by comparison with his great-grandfather. His money wages are four times, and his real wages, as measured by their purchasing power, probably three times as high.

He has more leisure, if still not enough, and less back-breaking toil. His children do not start work, as his grandfather did, at the age of eight or ten. If he has been unlucky he may still be living in a damp insanitary hovel; but he may have a comfortable modern cottage with water laid on and even electric light.

But the chief benefit of agricultural progress has been the greater abundance and cheapness, and the improved quality, of the food which we eat. It is true that the poorer consumer of today can still not afford to buy all the milk and fruit, eggs, vegetables and meat that are necessary to a fully healthy life. But we have had no famine in Britain for ninety years, and ever-faster progress is being made towards the complete solution of humanity's oldest problem—that of getting enough to eat.

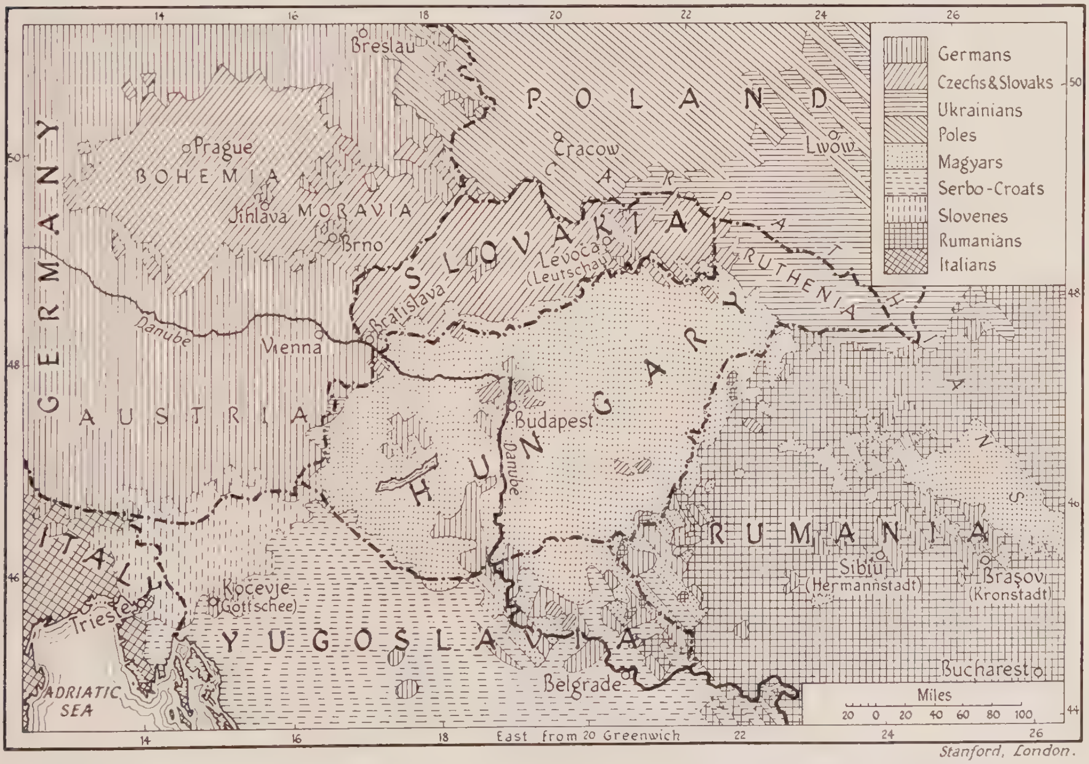
Outside the Fold

IV. The Saxons of Transylvania

by CHRISTOPHER HANKEY

Browning has recorded the legend that the Saxons of Transylvania are descended from the children enticed underground by the Pied Piper of Hamelin. Even though their origin is in fact more prosaic, these remote settlers have preserved for 600 years the romantic atmosphere of the fairy-tale Germany which was the natural background of such delightful traditions. While the blood-and-earth-conscious Third Reich may repudiate that older Germany, it remains part of the heritage of every European child

Transylvania lay stretched at my feet, like a giant relief map 7000 feet below, partly submerged under a sea of white clouds. I was standing on the summit of the Bucegi in the Southern Carpathians, and it was my first sight of the land of the Seven Castles—or Siebenbürgen, as it is called by its German inhabitants. I gazed at it curiously, to see whether it was really as romantic a country as its name would suggest. It seemed highly cultivated, in the parts that were not obscured by the clouds, with a multitude of villages and hamlets. But it was too far below to distinguish any details with the naked eye, and it was cold in the early morning mountain air, in spite of the bright sun, so I retired for breakfast to the comfortable hut which stands near the top of the mountain. I noticed a swastika painted on a rock outside, and wondered whether it was indicative of the political opinions of the people in the land I was about to enter.



(*Compiled from material contained in maps published by the General Staff, War Office, in 1918*)

After consuming a large quantity of fried eggs and coffee, I began my walk down into the land of the Siebenbürgen, joined by a young Rumanian flying-officer, who was going my way. As we descended the path, at first through precipitous and fantastically shaped rocks, then through thick pine forests, I began to see that the neat hamlets clustering round their homely churches were entirely German in character, and had nothing in common with the Rumanian villages I had seen on the south side of the mountains. The inhabitants, I had already discovered from my guide-book, were equally distinct from those of Walachia and Moldavia. Though commonly known as 'Saxons', their original homes were in the Rhine and Moselle country, and they were invited by Andrew II of Hungary to settle in Transylvania to stiffen the defence against the Turks in the 13th century. Their status varied at different times, but it was the policy of the Holy Roman Empire to maintain them as a bastion of Christendom against the infidel. Except when under Turkish, and later under Hungarian domination, they held a privileged position within the Empire, and have maintained their German race and culture pure for 600 years. The city of Hermannstadt (now Sibiu) was never even occupied by the Turks, as it was always rich enough to buy immunity.

Christopher Hankey

The fantastic castle of Bran, fit abode for an enchanted princess, was built by the Saxons in 1212 as a bulwark against the Turks

When I and my companion were out of the mountains on the lower cultivated slopes, I found everywhere prosperous looking farmsteads, each built round a courtyard with white walls and red roofs, standing among cornfields and apple orchards. I asked my friend if all these farms were German. No, he said, this farm was Rumanian, so was the one we had passed a little further back. I was unable to see how he distinguished between them, till he showed me that some of the houses had wooden crosses on the tops of the gables, while others had wooden spikes. The crosses denoted Rumanian owners, the spikes German ones. I noticed that the crosses were very much in a minority. Did the Germans and Rumanians, who lived as neighbours, get on well with each other, I asked, or did they live in two separate and distinct communities? Oh, they got on very well, the airman replied, and I gathered that the Saxons were quite content under Rumanian rule, with no outstanding grievances.

Our conversation was somewhat limited

Christopher Hankey

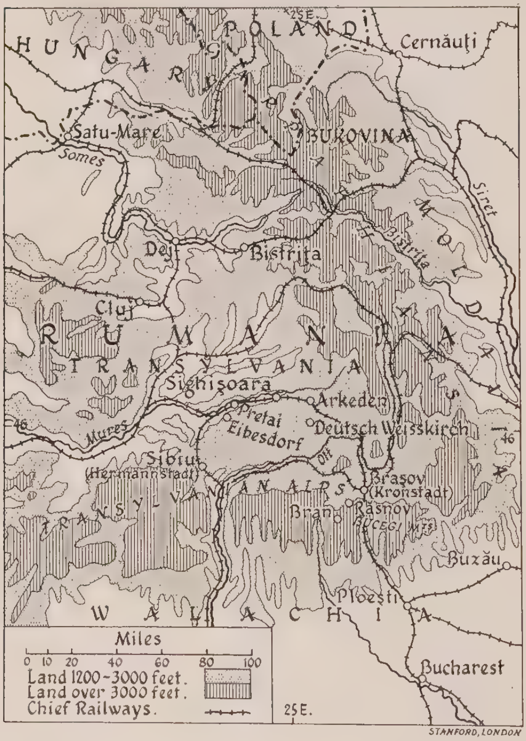
Even more romantic is the 13th century castle of Răsnov, which looks across one of the loveliest and most fertile parts of the Transylvanian plateau towards the towering Königstein mountains

by the fact that our only common medium of intercourse was French, and my friend's French was rather more badly pronounced and ungrammatical than mine, but his views on Rumania in general, and Transylvania in particular, were interesting. Especially since what he told me about the Saxons was not necessarily true, but seemed to constitute the opinion of most actual Rumanians. They like to think that the Germans are completely absorbed into Greater Rumania and have no exclusively German aspirations. This, I was later to discover, is by no means the case, but I was unaware of it on this occasion.

I said goodbye to the flying-officer when we reached Bran at the foot of the Bucegi, as our ways parted here. Before taking the bus for Braşov, I had time for a look round the village. It is partly German and partly Rumanian, but its most striking feature is the great mediaeval castle which dominates it. It is one of many such fortresses built by the Saxons as bulwarks against the Turks, and it is most effectively situated, standing on a rock at the entrance to a valley which leads through the Carpathians to Walachia. With its innumerable towers, turrets, battlements and red roofs, it seemed to me more like the castle in 'Snow White' than a real fortress. Actually, it used to be one of the residences of Queen Marie, and was the place of her death in the summer of 1938.

I had no time to go inside it as the bus was leaving for Braşov. The half-hour journey was one of the most uncomfortable I had ever undertaken, as the road was shocking and the bus went at a good 30 miles an hour. I felt that if it had ever had any real springs, they must all have been broken long ago. But the discomfort was more than made up for by the interest of the country through which I passed. The villages were all Saxon, with white or yellow houses, generally built end-on to the road, having red roofs and large arched entrances to courtyards. Over these gates were inscribed the German names of the owners, and though such dates as were given were usually from the 18th or 19th centuries, I felt that the atmosphere of these villages was little changed from that of the Middle Ages. At Răsnov, or Burg Rosenau, as the Saxons call it, there was another magnificent castle, less fantastic than that of Bran, but, if possible, more romantic and picturesque. The landscape between Bran and Braşov as a whole is particularly beautiful with its flat maize fields, clustered Saxon villages, and the mountains towering imposingly beyond.

Braşov itself, the Saxon Kronstadt, is a town with a homely and attractive atmosphere, contrasting favourably with the somewhat bric-a-brac and unsubstantial appearance which is apt to strike the traveller in many Rumanian towns. Most of the city was burnt by the Austrians in 1689, and the spacious Black Church and fantastic Katharinentor are two of the rare buildings of note that survived. But the Rathaus, rebuilt in 1776, has a charming simplicity and the *innere Stadt* is still composed of old-world German houses such as I had seen in the plain, with their red roofs and criss-crossed tiles. Over the tops of the gables appear thickly wooded mountains—a spur of the Carpathians, which rise abruptly from immediately outside the mediaeval walls.



A particularly interesting and peculiar feature of Saxon Transylvania is the fortified churches. Picturesque, unusual-looking buildings, they stand as a grim reminder of the bloody days when the land was ravaged by the Turks, and the Saxon settlements, lone outposts of Christendom, had to resort to the best form of defence they could improvise. This naturally centred round the church—the nucleus of the townships and village communities, and the symbol of the faith for which they stood. In the earlier examples of these *Kirchenburgen*, the church proper was surrounded with a wall flanked by towers. Later, in the 15th century, the churches themselves were constructed or rebuilt as integral parts of a scientifically designed citadel. They present a striking appearance; in many cases they are scarcely recognizable as places of worship, nor do they resemble the usual type of mediaeval fortifications. They were built to hold the whole of the local Christian population, together with their most essential belongings, for a prolonged period of siege. Their effectiveness is proved by the fact that some of them never fell into the hands of the infidel.

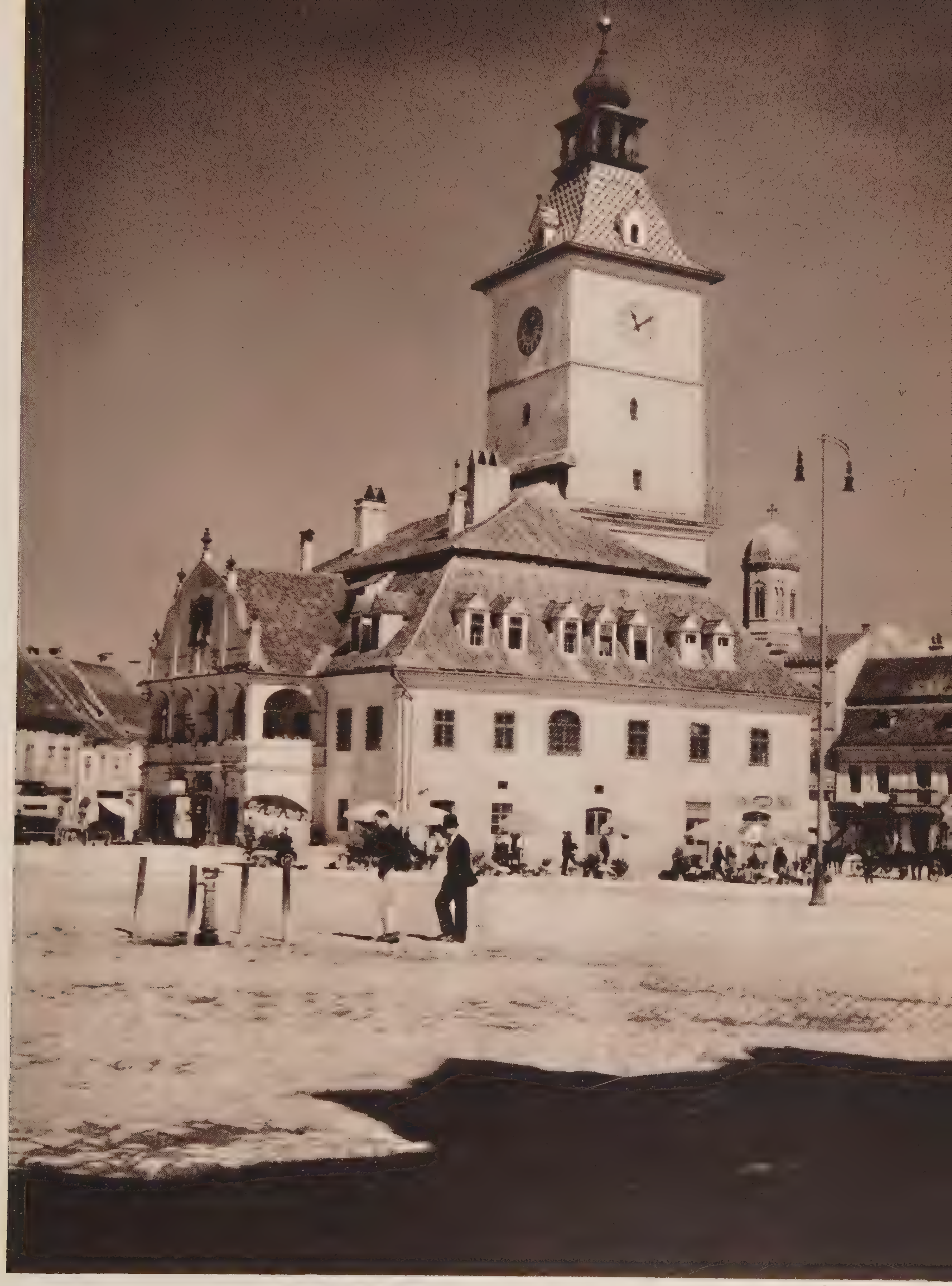
Outwardly, the most characteristic feature of the better preserved kirchenburgen is a square tower with a projecting

Christopher Hankey

Behind Råsnov castle lie the mountain ranges separating Transylvania from Walachia

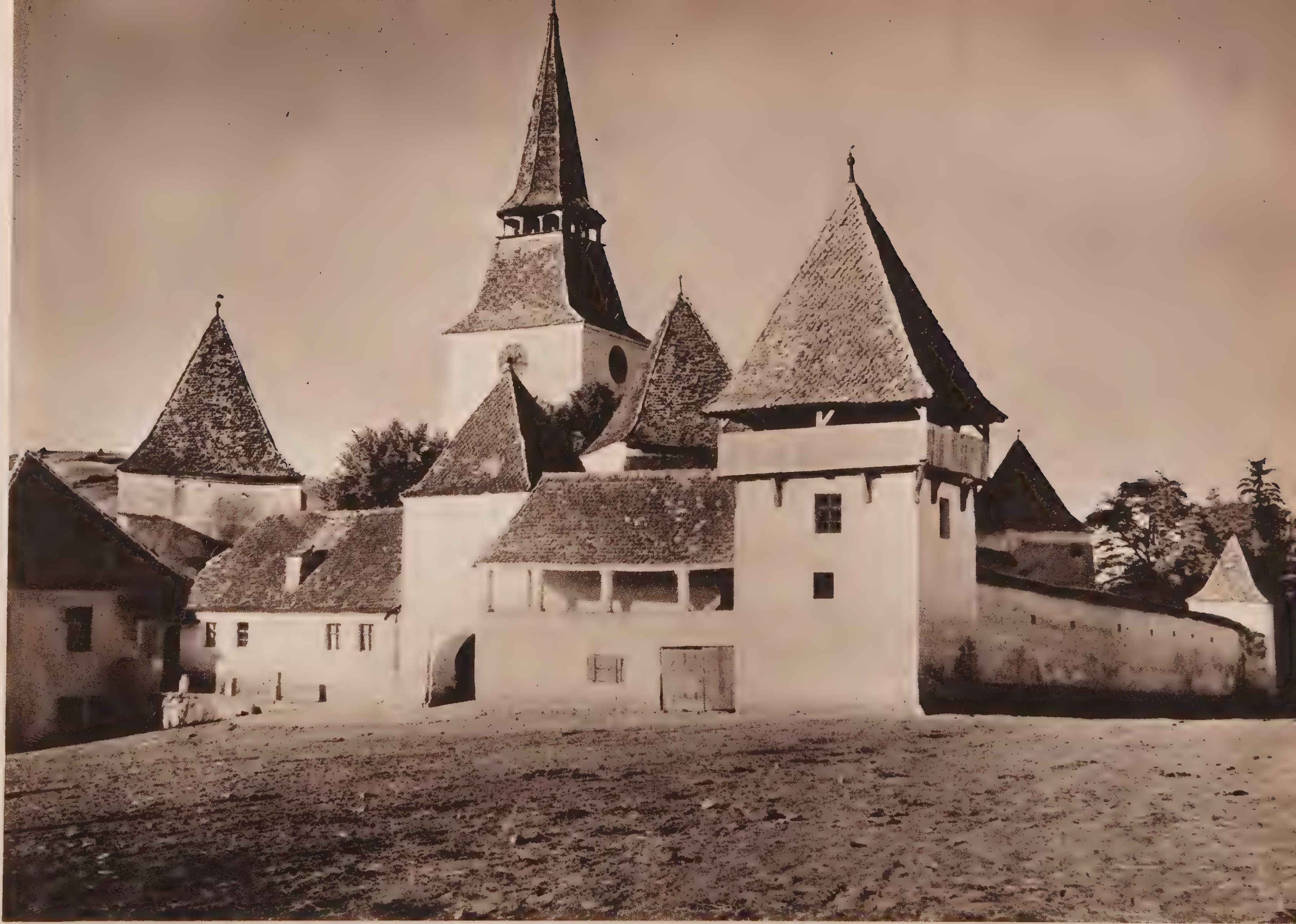
Christopher Hankey

Răsnov, like other Saxon villages, has red-roofed houses built end-on to the road



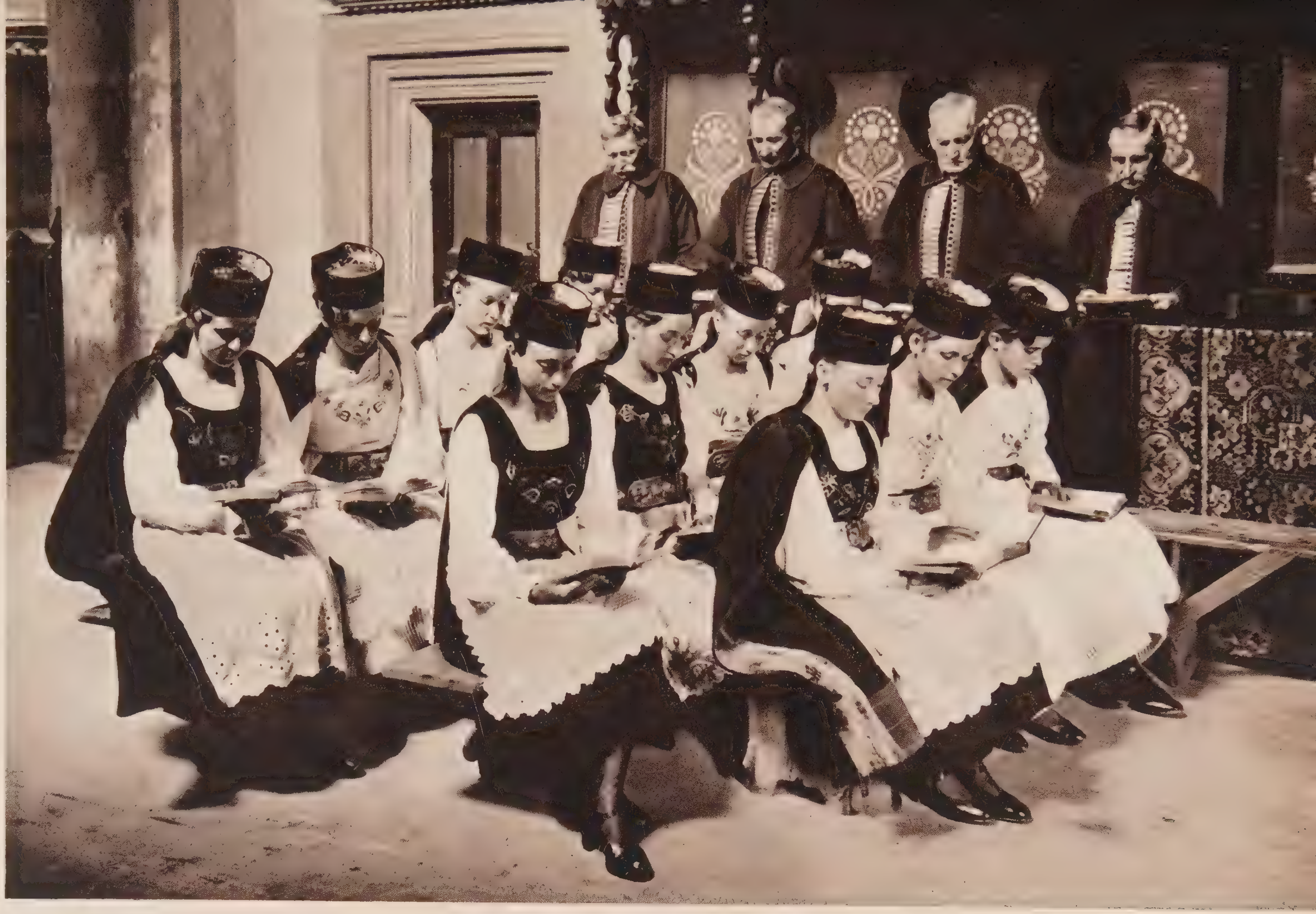
Christopher Hankey

The Town Hall of Braşov, built in 1420, was restored in 1777 in the baroque style



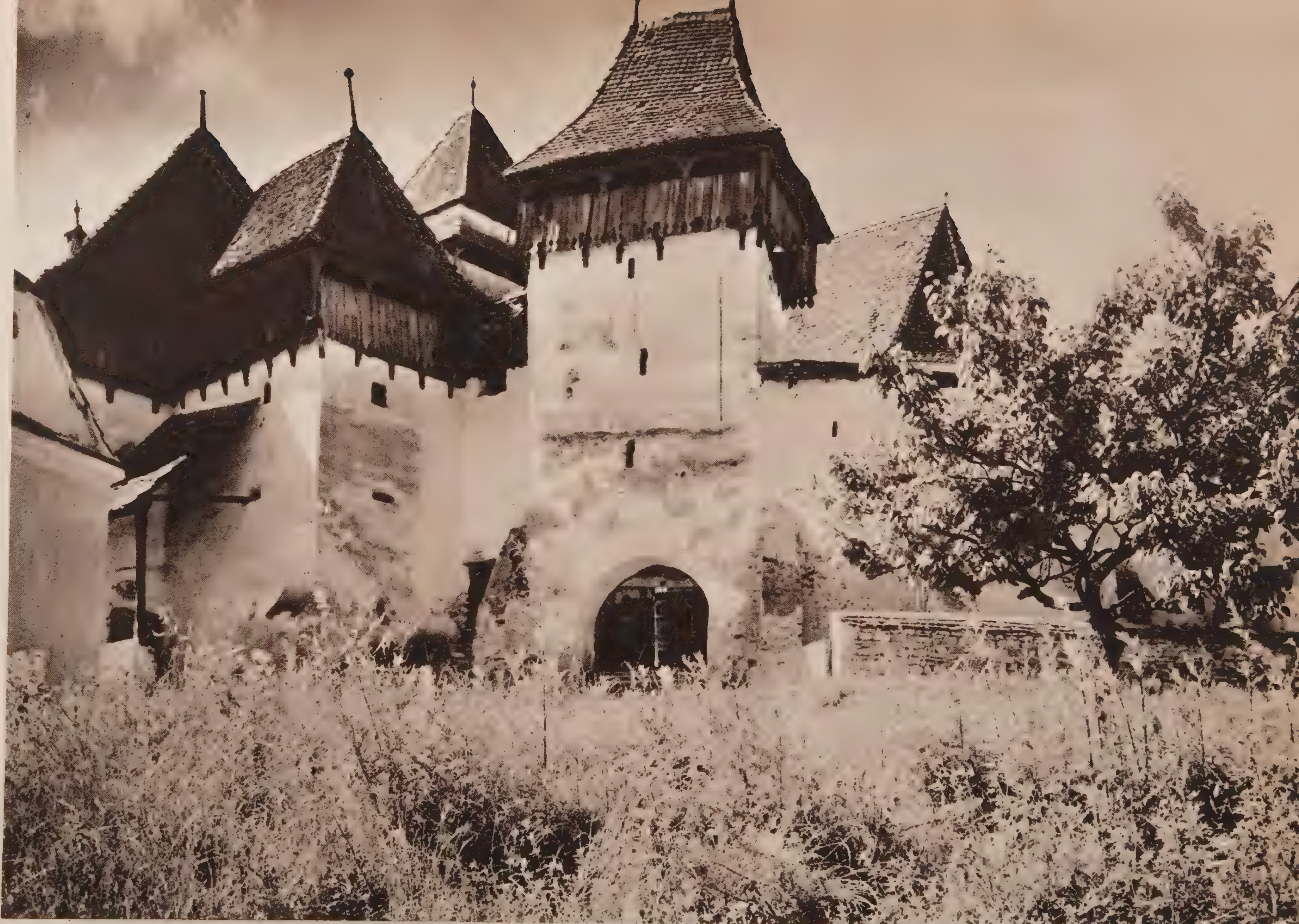
Kurt Hielscher

Many fortified churches were built in Transylvania to resist Turkish invasions



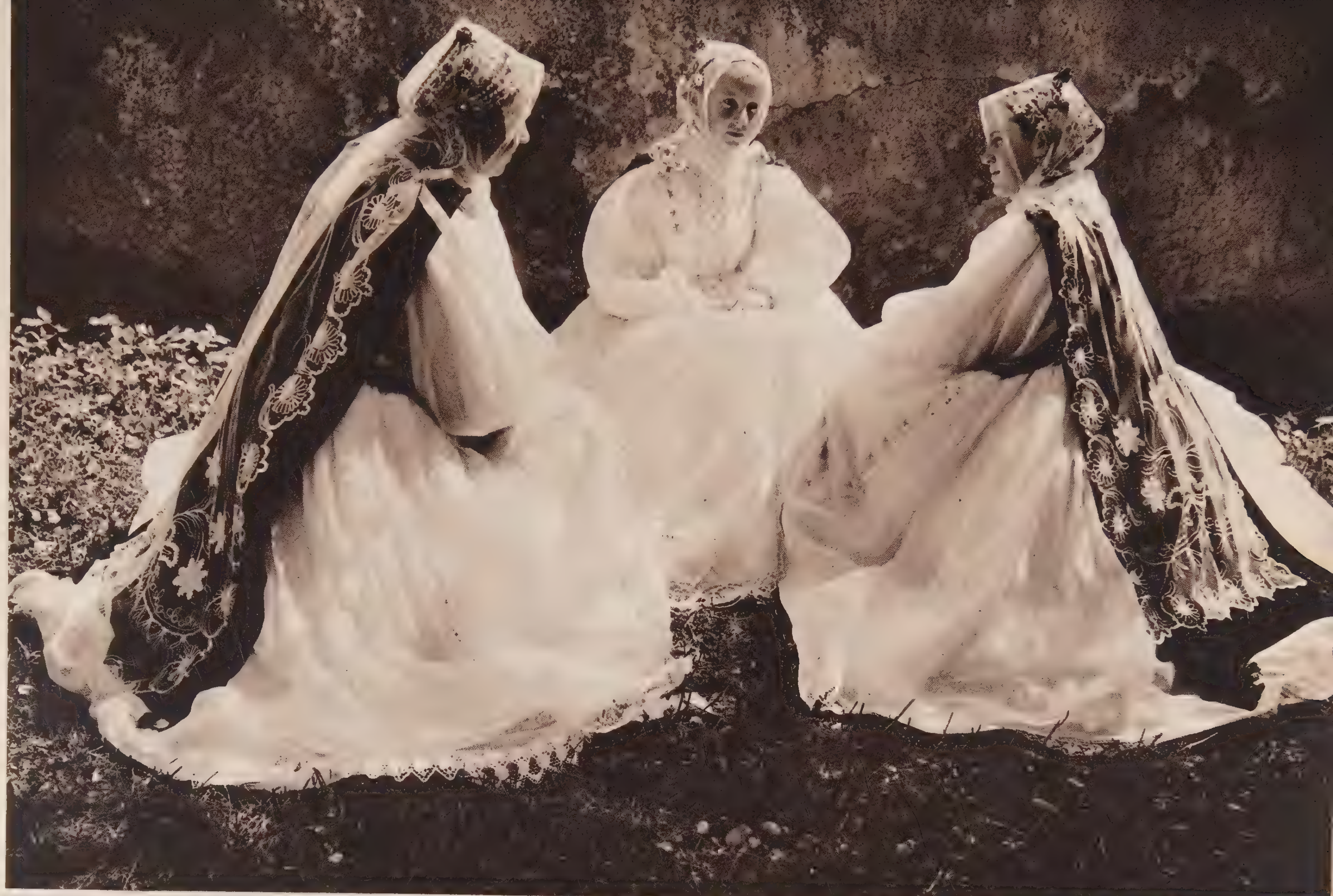
Kurt Hielsche

Siebenbürger costumes are seen at their best in church: one variant includes a long, blue mediæval cloak and gilt waistbelt



Kurt Hielsch

A double wall, bastions and towers with projecting wooden galleries lent defensive



Kurt Hielscher

The spirit of an earlier age transforms the wearers of this Saxon festival dress, with its velvet back-cloth and flowered veil

Christopher Hankey

No invader ever succeeded in overcoming the massive, turreted town walls of Sibiu wooden gallery, covered with a steep, pointed tile roof. In some cases, as at Pretai and Eibesdorf, there is a tower of this kind built up out of the body of the church, dominating the whole structure, and forming a gaunt profile, scarcely aesthetic, but fascinating in its singularity.

One of the more beautiful of the fortified churches (of which there are about sixty) is at Arkeden. The church itself is of the usual Saxon unfortified pattern, but is surrounded with a double wall and a cluster of flanking towers, each with its pointed red roof. It was a most promising subject for photography and sketching, but the time at my disposal at Arkeden was wasted by an irritating incident. Just as I was taking a photograph, I heard an officious "*De unde veniţi?*" behind me, and turning round, I found a Rumanian gendarme who wanted to find out all about me. He took me into a near-by ironmonger's shop, and with the stolid German proprietor as interpreter, inquired suspiciously as to what I might be doing in Arkeden. When I presented him with my British passport he showed surprise and said "*Ah, Francez!*" (French). I explained my nationality, but he was unwilling to believe that anyone should have come all the way from England for the purpose of sight-seeing in a half-baked village like Arkeden. He wasted most of the rest of the afternoon scrutinizing every article about my person, and all the contents of my wallet. When he had finished, it was pouring with rain, and nearly time to catch the last train back to the nearest hotel at Sighişoara.

I determined to return to Arkeden, in addition to visiting other fortified churches: but what I read in the papers that evening about the Sudeten crisis, then assuming alarming proportions, decided me to take the next train home to England.

The actual inhabitants of the Siebenbürgen land, named after its seven fortified cities, are now mostly town dwellers, though formerly they appear to have constituted almost the entire population of south-eastern Transylvania. They have kept their Nordic blood absolutely pure, and are very proud of the fact. They consider themselves of an altogether superior caste to the Rumanians, Magyars, Gypsies and Jews among whom they live. They look down on their Rumanian rulers, and in many cases regard them with contempt. At the same time, for the most part they realize that they are far too small and too scattered a community to have separatist or irredentist aspirations. They admire Hitler and his system but have no illusions about being swallowed up into it. Perhaps they appreciate, though without admitting it, that they are far happier and more prosperous under the tolerant Rumanian régime. As it is, they have their own schools, their own newspapers in their own language, and their own culture unimpeded. At the same time, they do in practice seem to be subject to certain civil disabilities. There appear to be no Germans in State employment. I noticed that all railway and police employees were not only Rumanian, but that they refused to speak any language but Rumanian, although German is almost universally understood in Transylvania. Whenever I myself got into difficulties or complications, I affected not to speak or understand a word of Rumanian, as my smattering of the language was quite inadequate for wordy argument. I generally found that the exasperated official with whom I was trying to speak would eventually abandon his pretended ignorance of German.

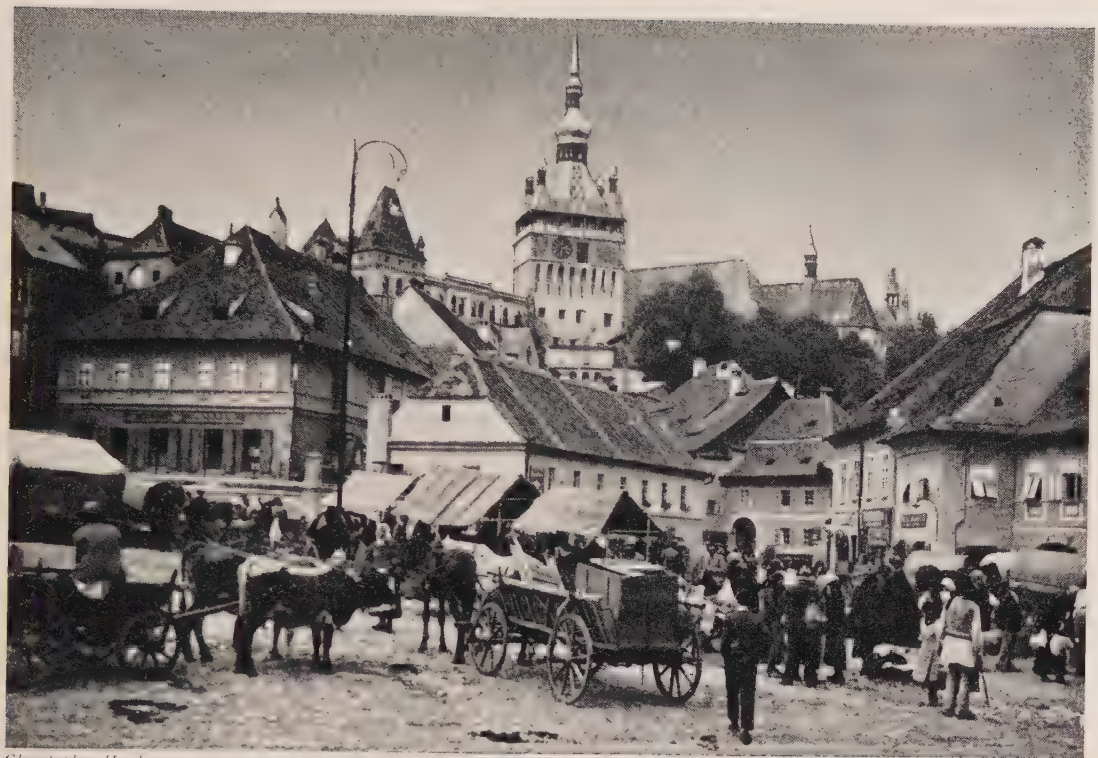
If the Saxons have no desire to return to the Reich, they have even less to be incorporated in a Greater Hungary. The Hungarians consider that the whole of Transylvania to the line of the Carpathians belongs to them by historical (and ethnological) right. Any territorial transfer of this land would be highly unwelcome to the Siebenbürgers, as their

Christopher Hankey

'Baths in private houses seem to be almost non-existent. At Sighişoara I noticed a train marked "Tren Baie" (bath train) in a siding . . . the local gypsies were being forcibly bathed in it'

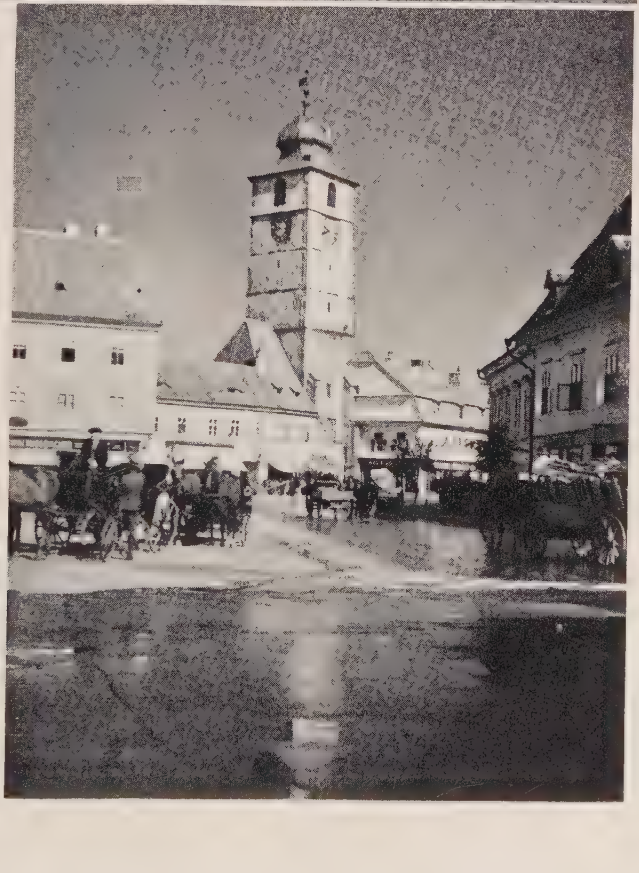
status now is very much more favourable than it was before the war. They regarded the creation of the Dual Monarchy in 1867 as a betrayal of their position by the Habsburgs. In passing under the Magyar yoke they lost the privileges they had at least theoretically enjoyed since the 13th century, when they were persuaded to leave their homes in Germany. The Budapest Government tried ruthlessly to Hungarianize the whole of their section of the Empire, whereas the Rumanians make no such attempt in Greater Rumania. At the same time it is interesting to note that the latter mete out very much less favourable treatment to the Hungarian minority than to the Germans, by way of reprisals for the oppression they suffered under Hungarian rule.

Although the Saxons seem to constitute the richest and most prosperous part of the community in south-eastern Transylvania, their position is declining. In the principal towns such as Braşov, Sibiu and Sighişoara, the Rumanian elements seem to be on the increase. Rumanian suburbs are growing up round the outskirts, and are penetrating into a diminishing Saxon nucleus. The larger modern buildings—new and under construction—seem to be in the hands of Rumanian and not German enterprise. In what were once entirely German streets, new Rumanian hotels, stores, churches, factories and public baths, etc., are appearing. The latter are evidently very necessary, as baths in private houses seem to be almost non-existent in the ancient Saxon towns. In the station at Sighişoara I noticed a train marked 'Tren Baie' in a siding, with a much amused crowd round it. Some German friends whom I was with at the time told me that the train contained hot baths and that the local gypsies

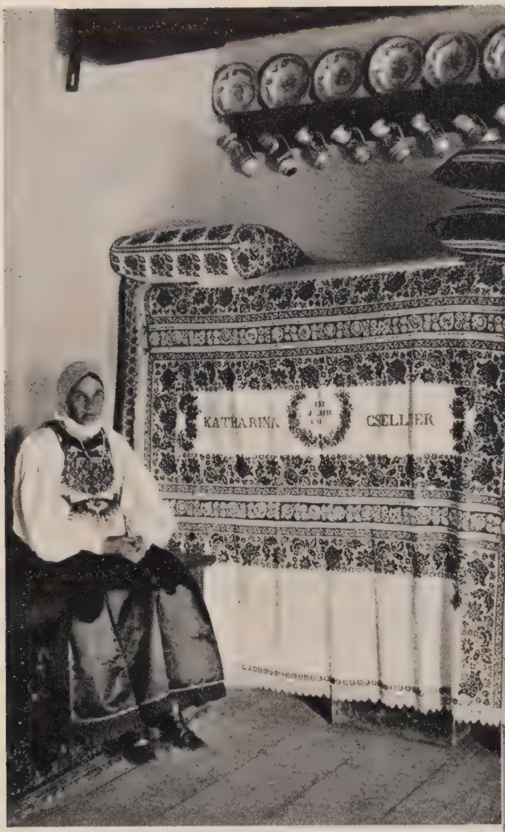


Christopher Hankey

Sighisoara, founded in 1280 by German colonists, combines in its wide market place and narrow streets a mixture of mediaeval and modern Saxon buildings



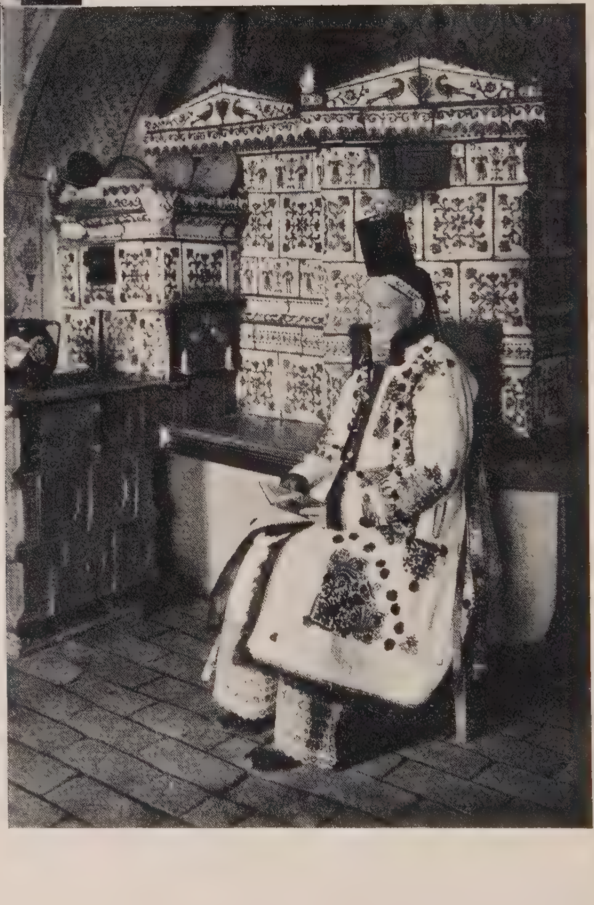
Sibiu, once the redoubtable capital of Transylvania, is also unmistakably German in character. In both towns an old clock-tower dominates the market square



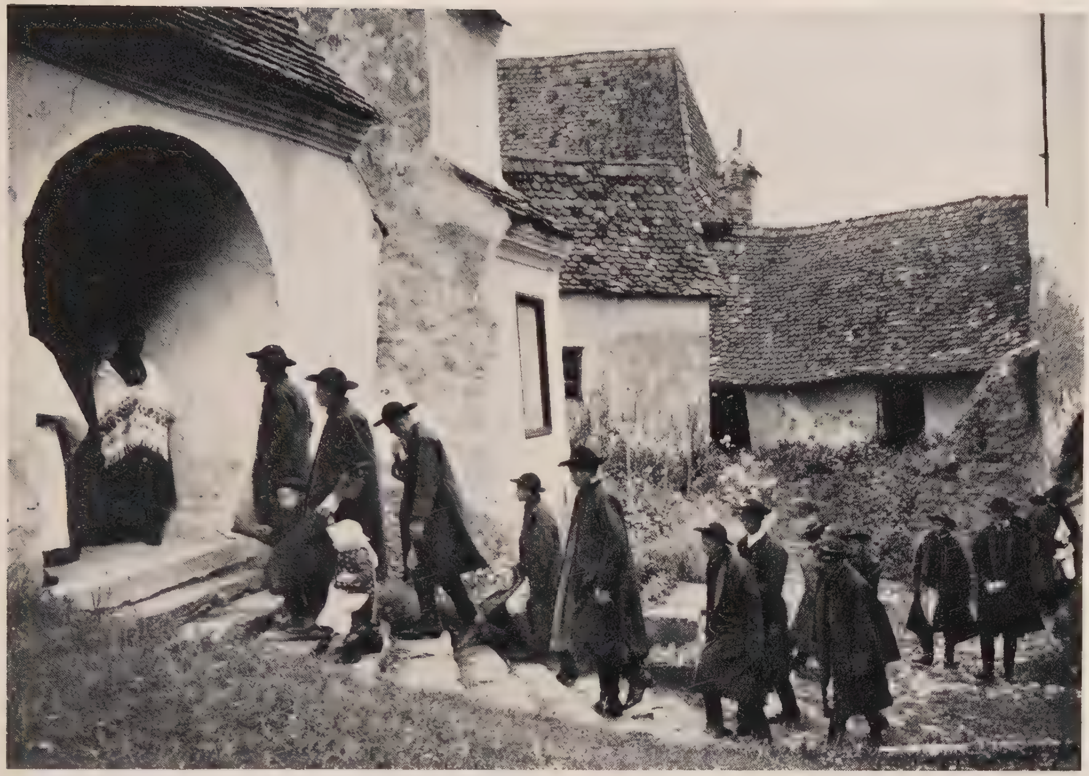
Kurt Hielscher

A bedroom in a Saxon house. The girl's embroidered 'dowry bed' contains almost as many mattresses as that in Grimm's famous fairy story of 'The Princess and the Pea'

Kurt Hielscher



Ready for church. Two distinctive features of the costume are the flowered lambskin coat and the Borten, *the velvet hat. Note the beautiful tiled stove in the background*



Kurt Hielscher

'The Siebenbürgen is the most easterly stronghold of Protestantism in Europe.' A procession entering the church in Deutsch Weisskirch; the men wear blue cloth coats with variously coloured sleeves and collars

had been rounded up by the gendarmes and were being forcibly bathed in it, much against their will. One of them tried to run away while we were there, but was caught and brought back by some of the onlookers.

In the country districts the shrinkage of the Saxon population is far more apparent than in the towns. In the neighbourhood of Braşov, the Bürzenland, it is not uncommon to pass through a village composed of German houses, but inhabited entirely by peasants of Rumanian stock. This is even more the case further west near Sibiu, where whole districts have been vacated by Germans who had lived there for centuries, and taken over by Rumanian peasants. The latter have decorated the houses in their own peasant style, painting them blue, and imposing characteristic Rumanian paintings and carvings, which give a curiously hybrid appearance to the streets.

While passing through a stretch of country that had changed hands in this way, I became engaged in conversation with a friendly Siebenbürger sitting next to me in the train—a school teacher from Sibiu. I tried to discover how he and his fellow Saxons felt about the Rumanian invasion of what had formerly been their own farmlands. He replied with mutterings about the Jews and hard times, but I failed to obtain any particularly illuminating views or explanations. It did not seem a cheerful subject of discussion to him, and the conversation turned to religion.

"The Siebenbürgen," he told me proudly, "is the most easterly stronghold of Protestantism in Europe."

"But surely," I asked, "there are also large numbers of Roman Catholics among the Saxons? In almost every German village I have seen there have been two churches, and one of them is presumably Roman Catholic."

"Ah, well," he admitted, "there are a certain number of Catholics, but the Roman Church is mainly a Hungarian institution, and its priests are all Magyars." I also understood that as a result of this, the Roman Catholic church uses its influence to further the cause of Hungarian irredentism, and a return of Transylvania to the rule of Catholic Budapest.

"Well, what about the German communities in other parts of Rumania?" I inquired. My Saxon friend again admitted, somewhat unenthusiastically, that all these were Roman Catholics. In fact it would appear that for the more old-fashioned Siebenbürgers, the religious difference is an obstacle to union between the Saxons and the various other groups of Germans in Rumania.

On the other hand, the younger generation of the Saxons is less influenced by religion or by the traditional distinctiveness of the Siebenbürgen. It would like to strengthen its ties with the other Germans scattered throughout Rumania—in the Banat, the Bukovina, Bessarabia and Bucharest. The German youth have held labour camps in the last few years in which Rumanian Germans of all kinds have taken part jointly. There is no question of adopting the *Ein Volk, Ein Reich, Ein Führer* slogan, however, and they enthusiastically drink the health of their Hohenzollern king, who is, to a large extent, responsible for the relatively enlightened treatment of minorities in Rumania. In the days of parliamentary government, the policy of the German People's Party, of which the Saxons were the leading group, while defending and furthering the rights of the German minorities, was to accord loyal and wholehearted support to the National Rumanian State. Actually, I never succeeded in getting any Saxon to pronounce decided views on internal politics. I imagined that this was because the gathering clouds of the Sudeten crisis overshadowed all other issues, but I was afterwards told by a Rumanian that private political discussions were apt to get people into trouble if overheard and reported to the police. The ruthless suppression of the Iron Guards a few weeks after I left would appear to confirm this.

The tendency for the Saxons of Transylvania to draw together with the other Germans of Rumania is likely to lead to a gradual loss of their distinctive characteristics. Other factors encouraging this tendency are the encroachment of modern Rumanian enterprise into what formerly were purely Saxon preserves, as already pointed out, and the declining population, caused to a certain extent by migration of the younger generation to Germany. On the other hand the Siebenbürgers have preserved their identity unimpaired for 600 years, in the face of far greater difficulties than they are likely to encounter now, and in any case the Germans of Rumania as a whole, with their increasing consciousness of common race, stand to gain under existing conditions.

Perhaps the trend towards greater unity is a reflection of the thorough welding together of Nazi Germany in which all local patriotism and separatism are submerged in the common conception of the one Fatherland. But it is to be hoped that the Germans of Rumania, of whom the Siebenbürgers are the most important section, will remain conscious of a separate destiny and duty as independent contributors to the stream of German thought—a stream which is too wide and deep to be restricted within the narrow channel that now confines it in the Reich.

Birds of the Scottish Highlands

by SETON GORDON

Mr and Mrs Seton Gordon's exceptional skill as photographers and discernment as observers of bird life are familiar to readers of The Geographical Magazine *and of the many books in which their experiences are recorded. These relate particularly to the Highlands, where they have made their home*

HIGHLAND birds may be described as belonging to three zones: the Forest, the Moorland, and the High Hills.

When I write of the Forest I have in mind not artificially reared woodlands, however graceful they may be, but the old and very noble Caledonian Forest, once the haunt of the wolf and the wild boar. This great forest, of which the trees were chiefly Scots pines, at one time extended across Scotland, from the glens of Ardgour in the west to the valleys of the Dee and the Tay in the east. It has now sadly lessened in size, but in places—and especially near the head-waters of the Dee and Spey—there are hundreds, even thousands of acres of the old forest, changed not at all from the days of Prince Charlie. Here are pines, some of them centuries old, growing not closely pressed together in the airless ranks of a planted wood but in open formation, so that each tree has grown to the full beauty of its form and its broad, spreading branches wave gently in the forest wind or moan with the sighing of sea surge when winter gales rush through them.

My forest zone shall be the great area of natural forest lying beneath the north slopes of the Cairngorms—Glen Feshie and Rothiemurchus, Glen More and Abernethy. To this forest area there come, in spring, the greenshank of lovely song, the delicately flying sandpiper, the redstart flirting his long, red tail, the sand-martin and the willow warbler. But the birds which I shall describe as typical of the old Caledonian Forest will not be these visitors, but will be limited to three—the crested titmouse, the grey or hooded crow, and the blackcock. And even of these three the blackcock and the hooded crow, although they make their home in the old forest, are not dependent upon it. Some critic may exclaim, "Surely the capercaillie should be given a place in your list—that handsome bird of noble size that lives always in the forest". My answer must be that, although I am loath to say so, the capercaillie is an immigrant. The last of its Highland clan died just over a century ago, and the capers which now prosper in Highland forests are of Swedish origin.

First, then, comes that little bird which may be described as the spirit of the pine forest—the crested titmouse. Most of the readers of this article will know the blue titmouse, the dapper little bird which comes without fear to the coconuts and the peanuts, and the suet hung outside one's window. The crested tit is similar in size to the blue tit, but its colouring is more subdued and its crest at once distinguishes it from all other British titmice. It is found widely on the Continent, but in Britain its home is in a comparatively small area (although of late years its range has increased) in the Scottish Highlands, in the shade and shelter of the old Caledonian Forest. So local is this small bird that although it is not uncommon in the forest to the north of the Cairngorms, it is unknown in the old pine forest of Mar, on the south slopes of the Cairngorms and not more than fifteen miles distant. The crested tit is a true native of the pine forest and never, summer or winter, strays from it.

When deer-stalkers are shooting the hinds in the frost and snow of winter, they tell me that the crested titmice keep them company, flitting above them through the trees and, when a hind has been shot,

All Photographs by Mr and Mrs Seton Gordon

The small, elf-like crested titmouse is a true native of the pine forest

flying down as fearlessly as a blue tit in a garden to feed on the fat which is exposed when the animal is gralloched by the hunter.

During the autumn and winter crested tits keep together in families, but early in spring, before the snow has melted below the old trees, they separate in pairs and search for suitable trees in which to nest. The crested tit nearly always digs out its own nesting hollow and does not, like the blue and the great tit, occupy a hollow that is ready-made. Because of the great ease with which it can be excavated, a dead pine is usually chosen, very often a small tree which has been killed by the shade of its greater neighbours. The nesting hollow is usually near the ground —from one to four feet above it—and thus is easily accessible to the numerous egg collectors who prize crested tits' eggs to the extent that they offer several pounds for a clutch. Yet despite the fact that scores of clutches of this delightful little bird's eggs are robbed each spring by collectors or their agents, the species does not apparently decrease.

The crested titmouse is a small, elf-like bird, and its movements are incredibly fast; so fast that they can only with difficulty be followed by the human eye. In the warm nest, lined with sheep's wool and deer's hair, far down in the hollow excavated by the birds, five or six eggs are laid. They are small and fragile, spotted and marked with rusty red. The eggs hatch in less than a fortnight into naked fledglings. These have voracious appetites and are fed on caterpillars, grubs, moths and butterflies from dawn until evening. During all that time one or other of the parent birds enters the nesting hole with food at intervals of five minutes or less, and if a human intruder approaches there

Carrion, eggs, young birds—nothing comes amiss to that arrant thief, the hooded crow

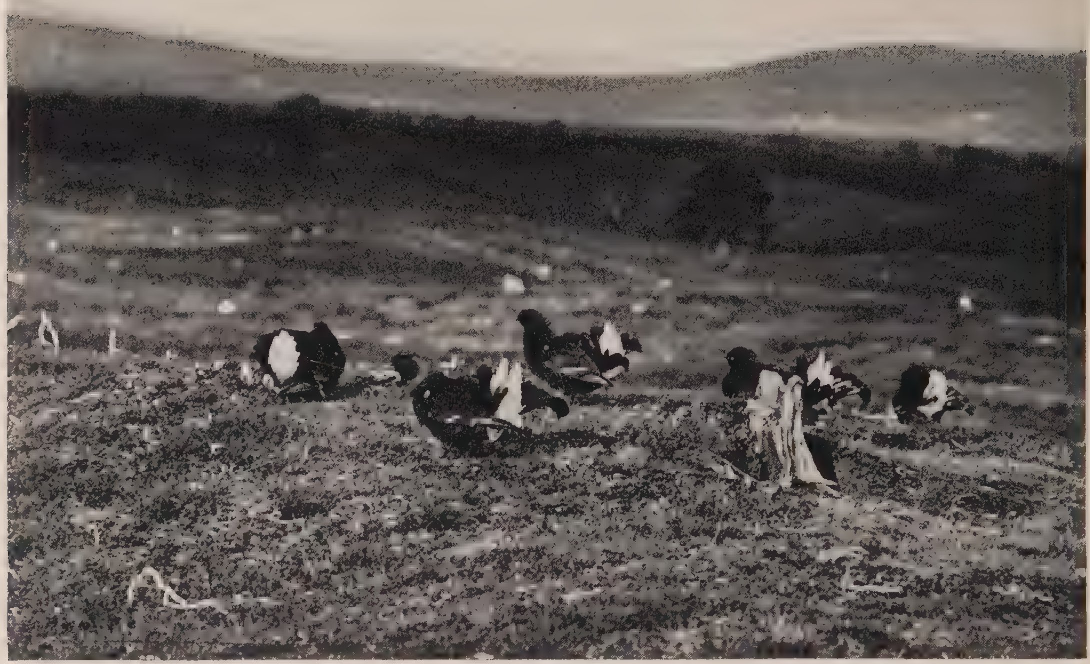
is much angry chattering. Compared with the other titmice, the alarm cry of the crested tit is hoarser and is pitched in a lower key: once heard, there is a curious quality in the call that causes it to be remembered without difficulty.

Even at the age of twelve days the crest of the young tit is already well-grown. At this time the brood leave the nest and throughout the summer and autumn flit with their parents through the tree-tops of the forest.

The grey or hooded crow is also a firm resident in the old Caledonian Forest and asserts its right over its territory in no uncertain manner when a wandering golden eagle flies overhead. Time after time I have seen a grey crow, or a pair of grey crows, in angry pursuit of an eagle, and never once have I seen the eagle pay the least attention to their impertinent swoops and dives. An old stalker once said to me that on these occasions he "admired the nobility of the bird". When I have watched the mobbing of a golden eagle by a crow his words have often come to me, yet I have wished that I might see the eagle turn on its small assailant and either hurl it headlong to the ground or else grasp it in those great talons which have crushed the life out of so many rabbits and mountain hares.

The grey crow is an arrant thief, and indeed no good word can be said for it. It searches assiduously for the eggs of all birds, large and small; not only does it suck the eggs—birds as large as the grey lag goose are victimized—but it eats young birds in, and out of, the nest. The hooded crow is also fond of carrion, and finds a welcome meal in any deer or sheep that has died in the forest.

The plump and handsome blackcock is notable mainly for its habit of engaging

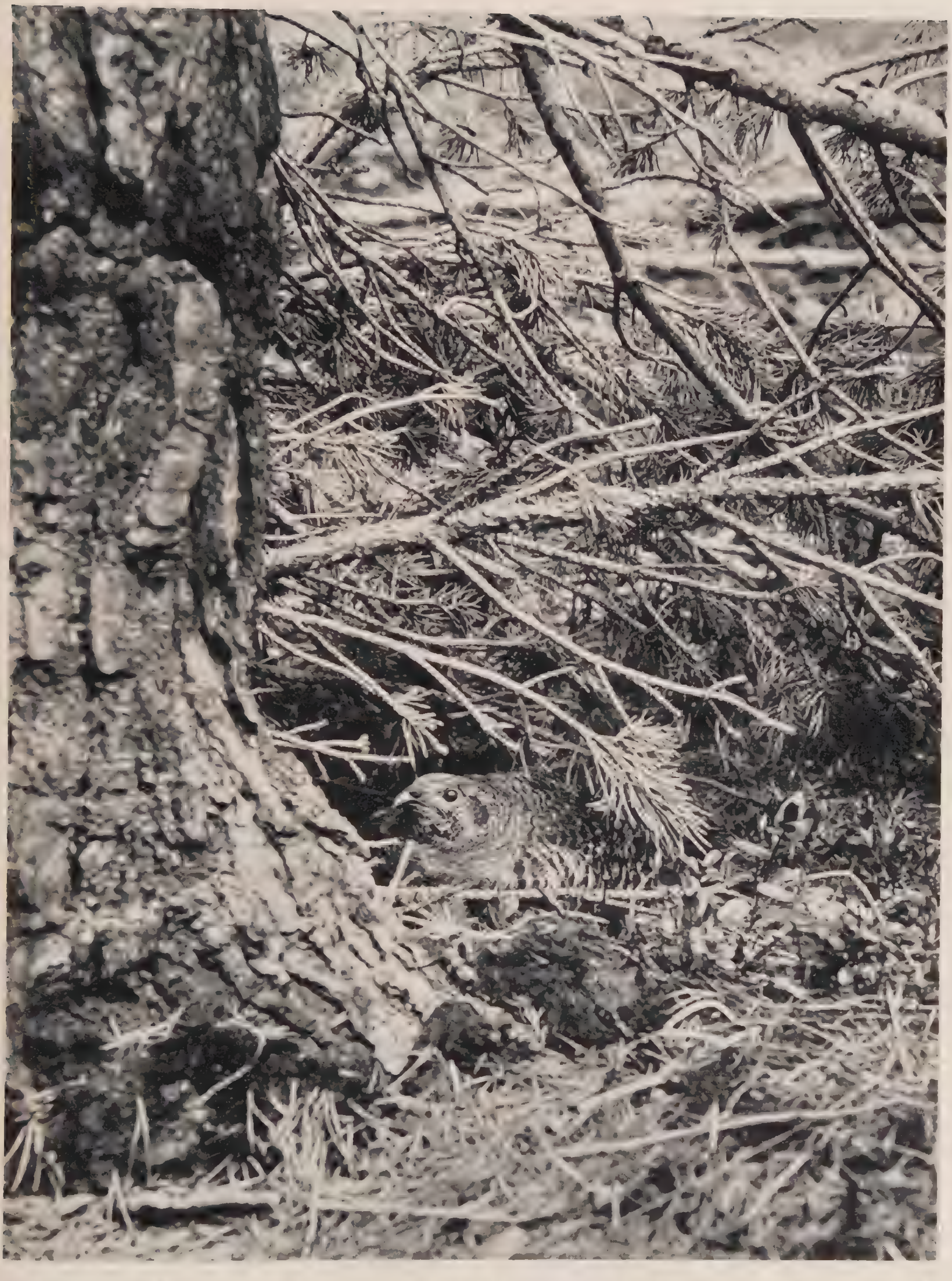


Blackcocks are famous for the 'displays' or tourneys in which they engage in the early morning

in tourneys each morning, very early, throughout the winter, spring and summer. The blackcock is the male of the black grouse, and the female is known as the greyhen.

The blackcock is polygamous, and does not pair with his mate and help tend the young family, like the red grouse. It can scarcely be the thought of showing themselves off to the members of the opposite sex which causes the blackcocks to meet and 'display' in the cold dawn of a winter's morning, for it is seldom that a greyhen is present at these 'displays'. The fighting-ground of the blackcock is usually a clearing in the forest, where the heather is short. The same knoll or clearing is used morning after morning by the birds, and becomes trodden down and strewn with their feathers.

The procedure at these 'displays' or fights is always the same. Early one morning, when an intense frost reigned in the forest and when the December moon was shining with warm, golden light on the snow-covered Cairngorms, I walked quickly over the hard earth to a favourite 'displaying' ground of blackcock and, covering myself with a sack, awaited the dawn and the coming of the birds. The first arrival flew swiftly through the air as the light of dawn contended with the paling moon. He was followed by one blackcock after another: all alighted on the knoll beside me, and at once began to display and to spar with one another. The birds crouched low on the ground. They held their wings half open and drooping, and spread out their tails so that the white inner tail coverts were shown,



The blackcock is polygamous, so that his mate, the greyhen, has to bear the family cares alone. Male and female receive different names perhaps because they are so unlike in appearance opened fan-wise. One bird challenged another to combat and the pair, uttering a low, bubbling cry, quickly repeated, faced one another and danced backwards and forwards like trained boxers, seeking an opening. Then of a sudden the opening materialized and the birds rushed excitedly one upon the other, striking with their feet, uttering a sharp hissing cry as they did so, and fluttering a little way into the air. Sometimes after these onslaughts feathers would float slowly to the ground, but usually no harm was done, and the birds would then work up for a second climax, or would seek fresh antagonists among their fellows that thronged the heathery knoll.

When the first rays of the sun shone upon the fighting-ground the birds ceased their bubbling cries, closed their wings and tails, and no longer stooped close to the ground but assumed an upright bearing, looking at once less imposing and strangely thin.

Blackcock are in the habit of flying up to a grassy slope in front of the house of a friend of mine and, after the early morning 'display', of feeding in full view of his windows. My friend shot one of the birds, to ascertain what it was that made that particular feeding-ground so favoured, and he found that the blackcock had been eating the leaves of a *ranunculus*—the month being December.

As birds of the moorland—and by moorland I mean the country that lies between the forest zone and the high hills—I take as my examples the golden plover, the red grouse, the raven and the oyster-catcher. It may perhaps seem strange that I have chosen the oyster-catcher, bird of St Bride, as a moorland bird, but I have done so in order to draw attention to the strange fact that although it is a coast bird in the west Highlands, in the central Highlands, to which it is a spring and summer visitor, it often nests on the same open moors as the curlew. There is indeed one moor well known to me where the nests of curlew and oyster-catcher can usually be found any day of early May within a hundred yards of one another.

Golden plover arrive at the moorlands rather earlier than curlews. Their arrow-swift flight as they skim low over the heather gives the impression of great power and supreme skill. Golden plover are great travellers and in autumn and winter fly south to France, Spain and even Africa. In autumn the birds lack the black breast and the white eye-stripe of the handsome spring plumage. The northern golden plover, which visits Britain during the spring migration on its way to its nesting haunts in Iceland and the far north, has a blacker breast and a whiter eye-stripe than its British cousin.

The melancholy, flute-like whistle of the golden plover is an integral part of the Scottish moorlands during the months of spring and early summer. It is a cry filled with a strange, elusive longing. Its call note and alarm cry the golden plover frequently utters, but its song is not often heard. When singing, the golden plover entirely changes its flight. No longer are the wings beaten strongly and swiftly: they are slowly and rhythmically driven downwards and upwards, and in time with each thrust a note of the song is sung.

Along the western seaboard the oyster-catcher is found throughout the year, but to the moors and rivers of the central Highlands it is, like the curlew and the golden plover, a spring and summer visitor only. In the west, the Gaelic name for the oyster-catcher is *Gille Bhride*, Saint Bride's Servant. Saint Bride, Saint of Art and of Beauty, took the oyster-catcher under her special protection because of the service it once did Christ. He, it is said, was closely pursued by his enemies, and it seemed that he could not escape them when a pair of oyster-catchers covered him closely with sea tangle as he lay exhausted on the shore, and his enemies passed him by.

The oyster-catcher in its black and white

'The melancholy, flute-like whistle of the golden plover is an integral part of the Scottish Moorlands during spring and summer.' It is one of the swiftest fliers in the British Isles

The oyster-catcher, bird of St Bride, nests on the open moors of the central Highlands

'Gamekeepers see to it that the fine, intelligent raven does not prosper on a grouse moor'

plumage and ruby-red bill (with which it does *not*, as its name seems to imply, catch oysters) is a truly handsome bird. It haunts most Highland rivers and their tributaries and, as I have mentioned previously, is sometimes found nesting on the moors of the central Highlands. Oyster-catchers in spring love to play a game which resembles 'Follow my Leader'. The birds, with heads down and with the tips of their red bills almost touching the ground, run excitedly backwards and forwards after the leader and all the time maintain a chorus of high-pitched whistles —short, sharp notes, so quickly repeated that one can only with difficulty distinguish the intervals between them. The oyster-catcher has a curious habit of lining its nesting hollow with the dried droppings of rabbits, and on these the eggs are laid.

The red grouse is unique in that it is the only bird which is a native of the British Isles and nowhere else. It is believed that the ancestors of grouse were ptarmigan, and since in most parts of the British Isles it gradually became unnecessary, with the receding of the Ice Age, for ptarmigan to assume a white plumage at the approach of winter, a new race was evolved, which harmonized with the heather rather than with the snow. Thus the red grouse originated from ptarmigan stock, and has thrived and increased ever since. It would be interesting to know how much money the red grouse brings each year into the Highlands: it has certainly been the saviour of many hard-up Scottish lairds.

On moors, as the shooting season progresses, grouse form into large packs, sometimes consisting of hundreds of birds, but in the Highland deer forests (a deer forest may be entirely without trees) where they are undisturbed, they remain in pairs throughout the year, and never wander far from their nesting ground.

The raven belongs to the moors, but gamekeepers see to it that this fine, intelligent bird does not prosper on a grouse moor. But in sheep country it is less disturbed, although even here it is sometimes shot, poisoned or trapped because of the fancied harm it does to the sheep and their lambs. There is no doubt that a weakly lamb does on occasion fall a prey to the raven, but this bird's usual food is carrion—a dead sheep or a dead deer lying out on the hillside attracts any raven in the district. It is interesting that during the stalking season the entrails of the gralloched deer lying on the ground should attract ravens which are not normally seen in the district: in flocks which may exceed a hundred they wander over the Highlands at this time, and find food in plenty awaiting them.

The raven is perhaps the earliest bird to nest in the Scottish Highlands, but it is curious that in the Hebrides, where frost and snow are rarely severe, its nesting should be some three weeks later than in the cold and snowy Border Country. Earlier in this essay I have described the hatred shown by the grey crow towards the golden eagle. The raven also has a hatred for that great bird, and loses no opportunity of mobbing and harassing any eagle that flies over, or near, its nesting territory.

And now I come to the last of my three headings—the Birds of the High Hills. Under this heading I shall deal with only three species—the ptarmigan, the snow bunting, and the dotterel—but each of them is, *par excellence*, a true mountain dweller. Who, for example, could imagine seeing a ptarmigan in the low country? And yet on occasion ptarmigan *do* descend to the glens, when a deep and prolonged snowfall has cut them off from all supplies of food. Old stalkers say that when ptarmigan leave their hill-fastnesses they never return to them; there is truth in that saying, for when ptarmigan are seen below the forest line they are almost at the end of their resources, and death usually comes to them. In the Scottish Highlands ptarmigan are rarely seen below the 2000-foot contour line. Their chief stronghold is the Cairngorm range of hills, where my wife and I have spent many days studying and photographing these mountain birds.

In winter the ptarmigan rivals the snow in the whiteness of its plumage, and even in summer the birds retain their snowy wings. To see a covey of ptarmigan suddenly rise from the dark hillside where they have hitherto been invisible, and fly off on white wings over some sombre abyss, is a very delightful sight. So tame are they that it is often possible to approach to within a few feet of them without causing them to fly. When brooding on her grouse-like eggs the tameness of a hen ptarmigan is sometimes remarkable, and I once removed an egg from under a sitting bird without putting her off her nest. I then gently lifted her from the eggs, and held her in my open hand. She remained quiet, and again I set her on her eggs. Three times I did this, and when finally I placed her on the nest she even then made no attempt to fly away. A few days later, when I visited the place, I found that she had successfully hatched off her brood. It might be thought that this habit of sitting so closely would render a ptar-

From its tameness the dotterel is called an t-amadan mointeach, *'the fool of the peat moss'*

'Old stalkers say that when ptarmigan leave their hill-fastnesses they never return to them'

migan easy prey for a fox, and although when she is brooding the bird is devoid of scent, I have in the nesting season sometimes found on the hillside a heap of feathers, showing where a fox has taken a ptarmigan.

Since the male red grouse is so devoted a father to his young brood it is curious that the male ptarmigan should leave his mate when the family hatch. These 'temporary bachelors' join into flocks and frequent the highest plateaus of the Cairngorms during the summer months, but it seems that they rejoin their mates after the family has become well-grown. Like some fathers of the human race they evidently draw the line at very young children and prefer during that trying period the shelter of their club—or its equivalent!

The snow-bunting in autumn, winter and spring is no uncommon bird on the high Scottish hills, but as a nesting species is very rare indeed. These winter visitors come from the far north, and as they remain on the high tops and plateaus of the Cairngorms until the early days of May, the naturalist (unfamiliar with their habits) who saw them at this time would almost certainly infer that they meant to nest on the Cairngorm heights. But let him return at the end of May and he will wander over the high plateaus for days without hearing or seeing a single individual.

At a distance, a cock snow-bunting with his dark plumage and white wings resembles, as he flies away, a miniature ptarmigan; to see a flock of these small birds rise from the summit of Cairngorm or Brae Riach is one of the most lovely sights imaginable.

The dotterel, or the 'little foolish fellow', received its name because of its remarkable tameness and friendliness. There is, I think, no British bird so supremely friendly to man. The female dotterel, like the modern lady of fashion, prefers to be unfettered by family ties. She does, it is true, consent to lay the eggs, but, this done, she considers that her task is completed, and entrusts her three handsome eggs to her husband. He (with good cause, smaller and less handsomely plumaged than she) broods for three weeks on his wife's eggs—she never seems to visit him or to encourage him in his monotonous task—and, when he has hatched them out, 'fathers' the family without any assistance from her. The dotterel in its flight and carriage resembles a small golden plover, but, unlike that bird, it is found only on the high and rounded hill-tops of the central Highlands, where it rarely nests below the 3000-foot level and where I have found the nest as high as 4000 feet above the sea. Here, on the longest day, the ground was snow-covered and frost reigned.

Departing as it does in autumn to Palestine and Africa, the dotterel must have the strange experience of wintering in summer warmth and summering in winter cold. The crested titmouse (as I noted earlier in this article) seems to be holding its own despite the work of egg collectors. I wish I could say the same as regards the dotterel, but I fear that it must become very rare, if not extinct, in Britain, unless some more adequate efforts are devised for its protection.

Birds like the dotterel and the snow-bunting are seen by so few people that it is perhaps only natural that interest in their protection should be confined to enthusiasts. The attitude of the 'man in the street' towards them is perhaps exemplified by a remark that the Chief Constable of a great Highland county made to me: "I can understand and sympathize", said he, "with your efforts to protect a bird like the lapwing, which everyone sees, but when you speak of dotterel, greenshank, snow-bunting and crested tit—birds which no one, or at all events very few people, ever set eyes on—I fear that I cannot summon up the same sympathy for their welfare".

Giant Fish Traps of Siam

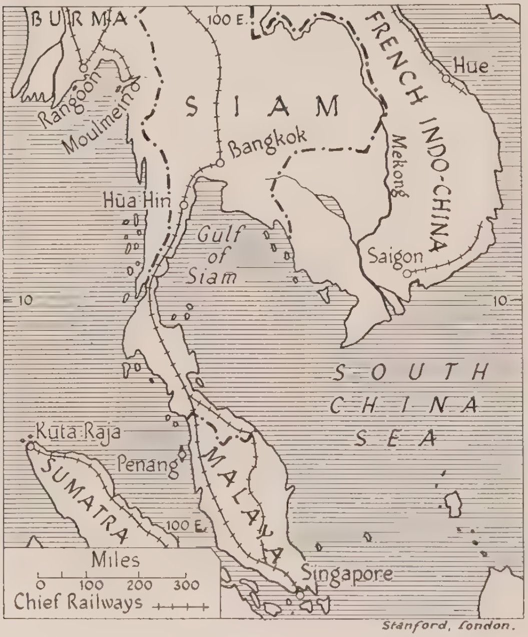
by W. B. M‘QUITTY

NINE thousand feet above the Gulf of Siam our westbound mail plane drones towards Bangkok. Far below moves the swift shadow of our wings, skimming over gigantic hearts a hundred yards across and arrows a mile long.

"What are they?" we ask the steward. But the steward does not know: he is a stolid Dutchman and has made the Batavia-Amsterdam flight too many times to wonder at what passes beneath his flying kitchen. Travelling at a hundred and fifty miles an hour does not leave much time for conjecture and the problem is still unsolved when the big plane glides into the capital of Siam.

The fishing village of Hua Hin lies a hundred miles south of Bangkok and thither I go, determined to see the hearts and arrows at close quarters.

All roads or rather lanes in Hua Hin lead to the sea, so, choosing one near the modern railway hotel, I start my quest. As my lane descends, the houses on either side rise on shaky stilts, immodestly exposing their bottom floors. The problem of what to do with baby's bath presents no difficulties in Hua Hin: it is simply turned over and the contents sluice through open joints. Discarded vegetables and other oddments find the same outlet, but rubbish does not accumulate for Nature's dustman, the tide, sweeps away the debris twice a day with unfailing regularity.



Stanford, London.

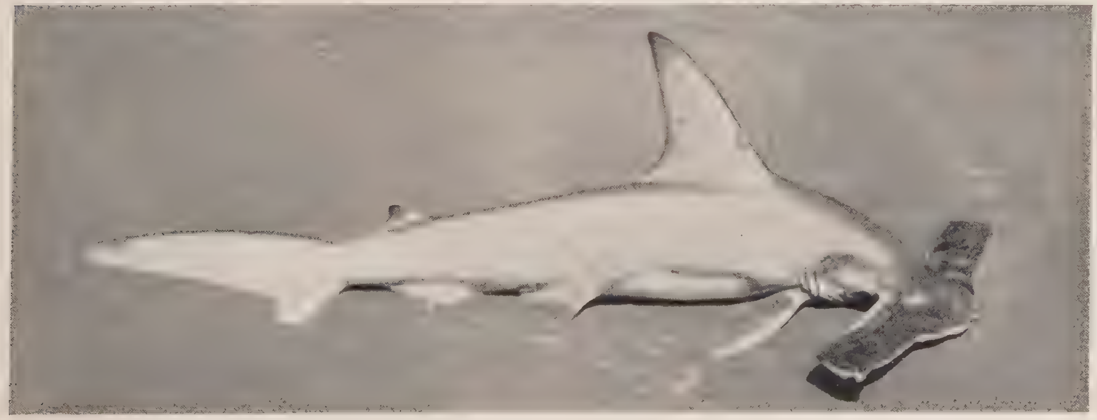
Further down the lane glimpses of blue sea appear between the sun-scorched houses, and with the ozone comes a smell of tarred rope and drying fish. Dusty pariah dogs greet me with ominous growls, fading to whimpering reproach as I raise my stick, but otherwise my arrival is unheralded. Under the hush of the hot afternoon the village sleeps.

Suddenly, as if they knew their stilts were no longer trustworthy, the houses form up in a line along the margin of the beach. Beyond them lie the fishing boats, stranded at odd angles by the receding tide and here and there are scaffoldings on which hang swathes of drying nets. In front of the houses stand temples to the local gods, dolls' house dwellings perched on six-foot posts to protect them from the sea, each containing simple offerings and a tiny lamp to light the god when darkness falls.

Disappointed by the absence of human beings I am about to retrace my steps when a series of shrill cries attract my attention. Scampering towards me come a mob of children of all ages—joyously naked. I consider a dignified retreat, but it is too late and in a moment I am surrounded, and besieged with demands for "*s'tang, s'tang, s'tang!*"—the copper coin of the country, worth less than a farthing. Cornered, I give and give until my reversed pockets convince my captors that their victim has no more to offer. Satangs

All photographs by W. B. M'Quitty

'. . . Some blue sharks and a hammerhead almost as big as two of them put together'



The hammerhead's eyes may just be discerned at the extremities of the 'hammer'

The fishermen's gnarled fingers move through intricate meshes with surprising nimbleness. This one seems happy enough, but occasionally shark or sting-ray make the mending of nets no laughing matter

are carefully stowed in conveniently stretched ears and in answer to my requests these golden-skinned babies dive into a near-by boat and stagger back with some blue sharks and a hammerhead almost as big as two of them put together.

Time steps lightly and at five o'clock the village awakes. Slim Siamese girls, grave and graceful, make their way to the water's edge where they wash themselves and their pretty garments with a quiet matter-of-factness. Rugged fishermen bend over gear, gnarled fingers moving through intricate meshes with surprising nimbleness; and everywhere slinking pariahs weave through the throng in their everlasting quest for food. Waiting my opportunity I approach a weather-beaten old man and ask him what the hearts and arrows are.

"To catch fish," he replies, his face wrinkling in a grin.

"May I see them?"

"Yes, yes, come in my boat. I sail at ten tonight."

Gratefully I accept his invitation and

walk back to the hotel feeling that I have made a good start.

On my return to the beach the moon has risen and hangs behind the cobwebby nets. Silhouetted against the tide my host awaits me in a dugout canoe which he skilfully paddles to his boat. Once aboard, he blows a triple blast on a conch shell, in answer to which his crew swim out, their clothes carefully tied on top of their heads to keep dry. One after another, like lithe brown seals, they slip over the side until we number eight all told. Anchor and sail are hoisted. We are off.

Outside the shelter of the land a fair breeze heels us over and we make good progress. The masts on Siamese boats are raked back to carry a square sail which under favourable conditions can drive them along at eight knots or more. The night is clear and a shimmer of phosphorescence crosses the water like shot silk and flecks our bow wave with green fire. Now and again sea snakes writhe away from us in glowing undulations.

Lying back on a comfortable heap of net I see shadowy outlines of hearts and arrows slide past: they have lost their romantic perspective and appear as so many mazes of dangerous posts sticking out of the sea. Three hours later we sight our objective rising from the moonlit water, a giant fence drowned in a flood. Sail is lowered and we tie up to the outside of the heart—a circular palisade strongly built and girdled with bindings of bamboo and wire. Now, to my surprise, the crew compose themselves for sleep.

"Hey! When are we going to fish?" I ask. But to all my enquiries I receive the same reply:

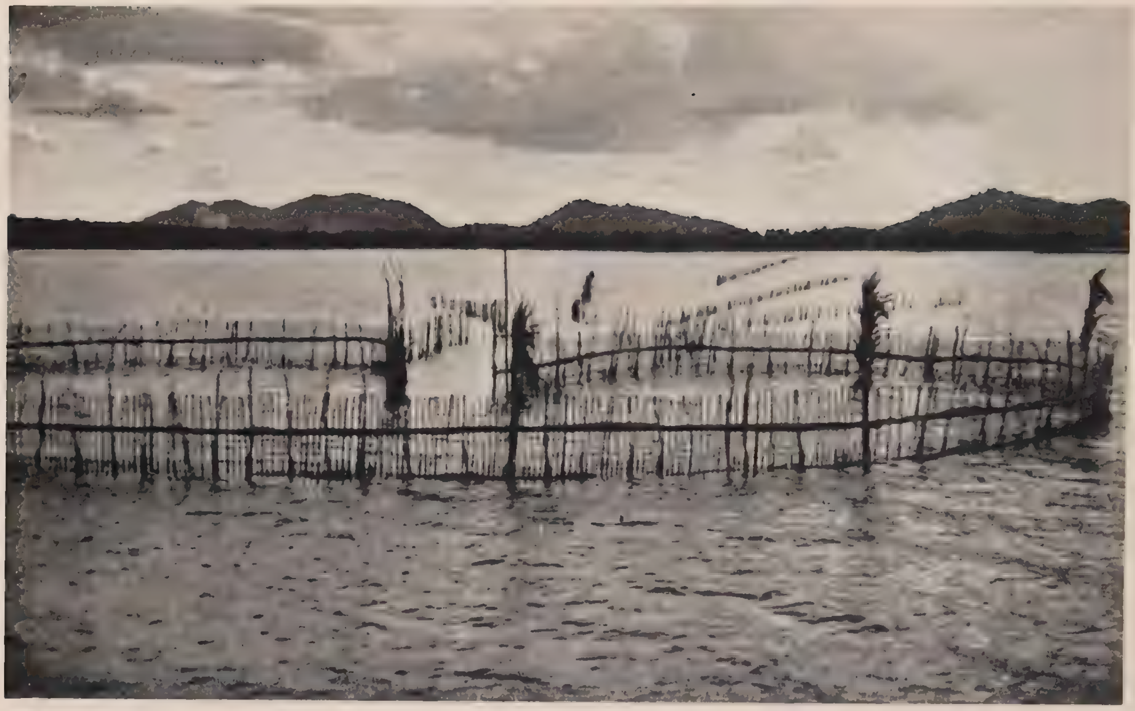
"It is not yet the time."

The slow roll of the boat in the swell is soothing and soon I join the crew in their slumbers.

It is cold and dark when I awake. Heavy clouds obscure the moon and the glare from half a dozen torches lights us on our way as the boat is manœuvred through the narrow entrance of the trap. Once inside I am able to see the general design: the heart shape is due to the entrance curving inwards and the arrow is a long avenue of stakes with shorter barbs leading into the trap.

I am hard pressed to keep out of the way: my comfortable net is hauled from under me and proves to be some hundred and sixty feet long by fifty deep. One end is fastened to an entrance-post of the stockade and the other to a long pole which the crew lash perpendicularly downwards from our bows. With the help of boat-hooks we gradually nose our way round the interior perimeter of the trap until we have completed the full circuit and the ends of the net overlap. All

Heading for the fishing grounds. When the wind drops, the crew are forced to use long sweeps; they row standing up, facing the bows



(Top) *A Siamese fish trap. It is a heart-shaped palisade of stakes, with a long avenue leading into it.* (Left) *Laying the net; 'with the help of boat-hooks we gradually nose our way round the interior'.* (Above) *Hung between the boat and the palisade, kept in position by wooden floats and lead weights, the net forms a bowl from which the fish are scooped* the fish that were in the trap are thus gathered into the net which has wooden floats to keep the top on the surface and lead rings to keep the bottom down.

The question now is to transfer the catch to the hold, for were the net raised, the fish would swim out from below. But the fishermen hold the answer. There is a stout rope woven through the rings and by hauling on it the bottom of the net is gathered together like an old-fashioned string bag. The fish have only one way of escape left and the clever ones come flipping over the top like so many silver tiddly-winks.

Red flames flicker on the glistening skins of the men as they heave and strain at the heavy net. Foot by foot it comes inboard until fish appear in the meshes, at first singly and then in twos and threes till every mesh holds a wriggling body. Some shining like moonstones, others glowing with the rich reds and greens of opal, these dwellers of the ocean slither into the hold.

At last the net is empty and while it is being stowed pale forerunners of dawn streak the western sky, changing dark shadows to rose as the sun lifts over the horizon.

The wind has dropped and the crew reluctantly put out long sweeps to row their boat home. They have seen many dawns and regard my expression with amusement as I sit entranced whilst the oars break the sheet-gold water into molten whirlpools.

At length in answer to numerous whistles a breeze fills the unlowered sail. In a twinkling sweeps are taken in and a grim-visaged seaman sets about preparing breakfast. Raising a floorboard near the stern he reveals a brazier lined with fireclay into which he puts a handful of wood-shavings and charcoal. Aided by the breeze the fire blazes strongly and soon the communal rice bowl, to which half a dozen sloppy cuttlefish have been added, bubbles merrily. When the meal is ready I am cordially invited to join the crew sitting round the pot, but the eyes of the cuttlefish look pathetic in stew and I politely decline.

By ten o'clock we are within sight of land and as we pass a trap that is in the process of being netted, I ask the skipper if he will stop while I take some photographs. He agrees willingly and I see the operation of the night repeated. The crew of the other boat enter into the spirit of the thing and pose like movie stars while I 'shoot' away to my heart's content.

Lashed to the stockade of this trap is a bunch of palm fronds beneath which hangs the dried corpse of an ugly red fish, a bony horror designed to scare evil fish away from the trap. Nets are expensive and the fishermen dread visits from such ob-

'Long-handled landing nets send showers of Pla Tu into the hold.' Pla Tu, a variety of small mackerel, constitute most of the catch

A speared cuttlefish looks dejected—with good reason

jectionable customers as baracuda, shark and sting-ray.

Standing beside this fishy scarecrow is a youth with a many-pronged spear. He has just accounted for a cuttlefish which he proudly holds up to be photographed. In its translucent body surges the sepia fluid that has earned for it the name of 'ink fish', for when frightened it squirts out this colour and tries to elude its enemies in the clouded water.

I clamber onto the stockade as the net is being raised. The first of the catch to make an appearance are the ubiquitous cuttlefish which circle round and round the limits of the net, their tentacles flowing behind them. Far below them the Pla Tu, a variety of small mackerel and the fish for which the traps are primarily intended, streak through the water in tightly packed ranks. Higher and higher comes the net until the weight of fish threatens to burst it. Long-handled landing nets ease the strain and send showers of Pla Tu into the hold and soon the net is empty except for a tangle of spiny blue crabs which are carefully picked out and placed in a box by themselves.

With the catch safely in the hold the men relax; it has been a bumper haul and many wants will be satisfied. To-night Nai Ooan's family will remember the almost forgotten flavour of roast pork. Jan his eldest daughter will clothe her lovely eighteen years in a new scarlet *sarong*, while her brother, Sampong, may realize his ambition to see Bangkok, the fairy capital of Siam where a man may find heaven in a thousand ways.

Photography finished, we continue our journey home. I ask my host how the traps are made and why the fish do not swim to freedom through the three-foot gaps in the stake avenue, or the six-inch gaps in the palisade. From his replies I gather that the stakes quiver in the current and the foolish fish are frightened to pass between them. Traps are expensive to construct and cost ten thousand ticals—one thousand pounds—or more. Each stake has to be driven through twenty or thirty feet of water, according to the depth, and then ten feet into the bed of the Gulf, several men working at the top and a diver directing the point. Bindings of wire and cables anchored some distance away strengthen them against the strong currents, but in the monsoon they are swept away and have to be rebuilt when fair weather returns. The traps are usually owned by syndicates of merchants who pay the Government licence and give the fishermen a small wage plus a percentage of the catch for their labour.

On shore I reward the crew and turn to the captain with a final question:

"Why did we wait until three o'clock in the morning to net our trap? Could we not have done it as soon as we arrived?"

"It was not yet the time," he replies and from the doorway of his home his pretty granddaughter, obedient to Granny's whisper, makes a farewell salute to the inquisitive foreigner.

The Modern Indian of the American South-west

by DR RUTH UNDERHILL

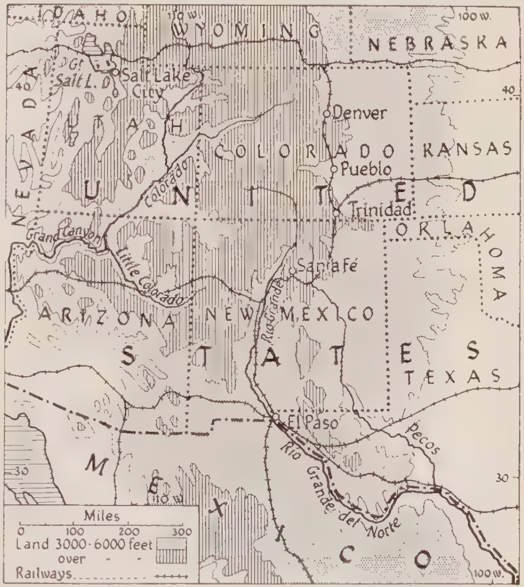
It is not always appreciated that there exist on the territory of the United States, besides the northern Indians whose ancestors were the nomadic hunters encountered by English and French pioneers, other Indians who inherit a civilization resembling that of ancient Mexico and Yucatan. To these Indians, and especially to their present condition as United States citizens, Dr Underhill's article relates

THE American Indian has become a standardized figure, almost a symbol. Lean and hawk-nosed, crowned with eagle feathers, he glares from the one cent piece or gallops through the pages of the adventure magazines, flat against his pony's side, shooting arrows at a herd of buffalo. The buffalo have vanished and the Indian, as far as general information goes, is vanishing likewise. Those who give a second thought to his fate, picture him as languishing on some remote reservation, supported by a Government annuity. Their usual attitude is that of the little Mavajo Indian boy in a Government school, who saw one of the popular pictures for the first time and exclaimed eagerly:

"It must be fun to be an Indian. Are there any left?"

In the symbolic sense meant, there are none left. But the Indian, as reality rather than symbol, is increasing. He does not, of course, wear the feather head-dress. Nor does he languish on reservations. There are approximately 190 reservations in the United States and 213,611 Indians living upon them. But, far from languishing, they are occupied with agriculture, cattle-raising and lumbering. They have the vote, they support themselves, and, aside from schools and medical service, the only aid they receive from the Government is that open to any citizen in sickness, old age and unemployment.

Reservations are owned by the Government which allows the Indians to live upon them, tax free, in return for their former lands, bought or obtained by conquest. Many Indians, however, do not live on reservations at all. There are 72,000 people of Indian descent in the state of Oklahoma living on farms which are now their private property and sending their children to school with the Whites. About the country, as far as census information goes, there are some 50,000 more working as labourers, craftsmen, farmers and professional people. They are in all grades of intermixture and assimilation, from the smart stenographer, with her silk stockings and permanently waved hair, to the barefooted old maize-grower who does not speak a word of English. All wear the clothes of the white man and eat the white man's food. One would have a long hunt among them for the Indian of the past.



Stanford, London.

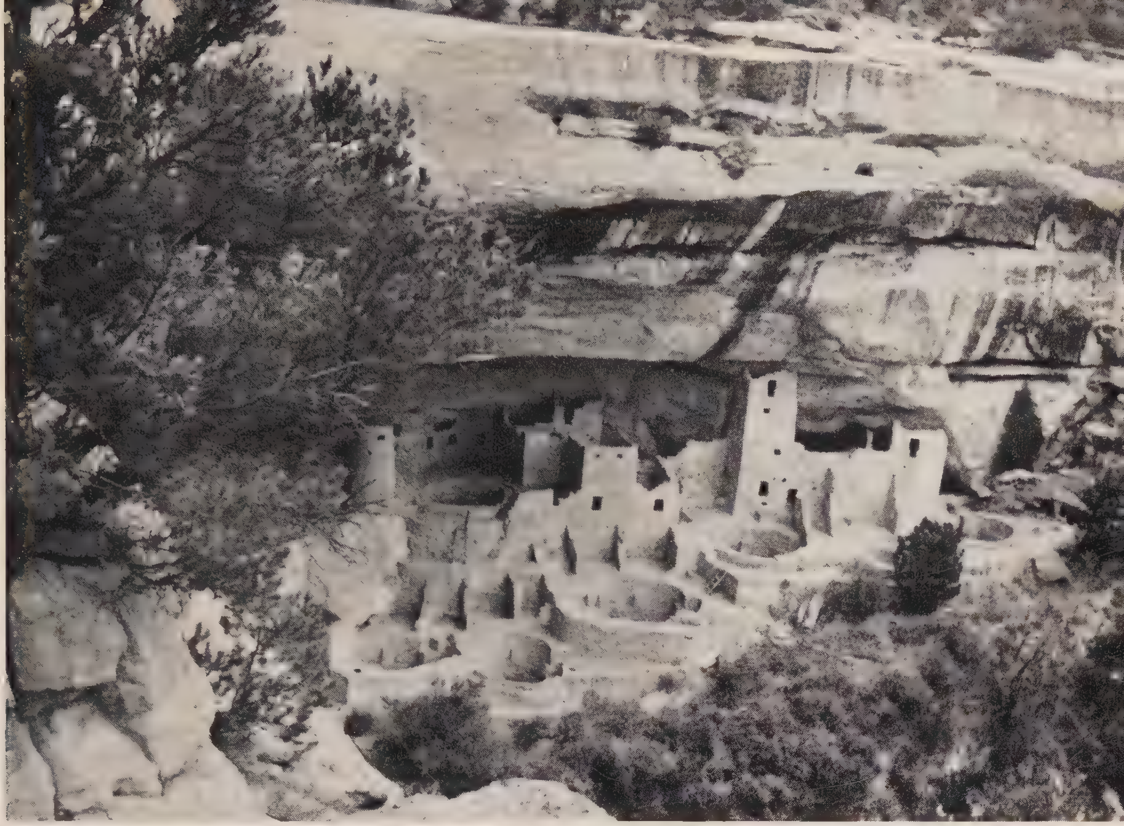
Except in the South-west! In that barren and beautiful country where the deserts of New Mexico and Arizona sweep down to the Mexican border, there are Indians living almost as they were when the white men first found them. Those white men were Spanish, which accounts for a great deal. Spain, which once owned all this south-western country, considered it far too remote for anything much in the way of exploitation or education. She had the Indians baptised and taught them to wear clothes—clothes which, today, are partly Spanish and partly Indian in a quaintly charming combination. She gave each village a royal grant to its land, which was not a reservation but property like that of any ranch owner. Then Spain gave place to Mexico and Mexico to the United States. In 1848 the Indians of the South-west became American.

'Pueblo' Indians, the Spaniards called them, because they lived in villages built of stone and clay (they are the only such villages on United States soil). So large were the villages, so complex their government, and so magnificent their ceremonies that they remind us of ancient Mexico and Yucatan. Nor were the Indians the hawk-nosed, predatory type of the Wild West stories. Small in stature, with delicate hands and feet, these Indians never donned a feather war bonnet and, in fact, avoided war whenever they could. Their livelihood came, not from hunting but from patiently tended fields of maize which have been waving in that very country for at least 1500 years.

Their civilization is not old, as history goes, for archaeologists say that they came to the South-west about A.D. 500. Not all at once, of course, nor from the same place, for they speak four different languages with several more dialects! Like the Whites who were to come later, they overcame the previous inhabitants by virtue of a superior weapon—in this case the bow and arrow; but, unlike the Whites, they lived at peace with the conquered and continued to grow maize. Then came their great era of civilization, perhaps the highest which took place on United States soil. Across five of the south-western states there sprang up villages of stone or clay so large, for those days, that we might almost call them cities. We may follow the valley of a dry stream-bed now and find thirty of these ancient villages packed within it. The villages are in ruins and their rows of roofless houses look like giant grey honeycombs on the hill-side. Was the cause drought? Disease? Enemies? It was one of those declines and falls recurrent in history and it took place before white men reached the South-west. When the Spaniards came in 1540 there were less than forty villages in all the country.

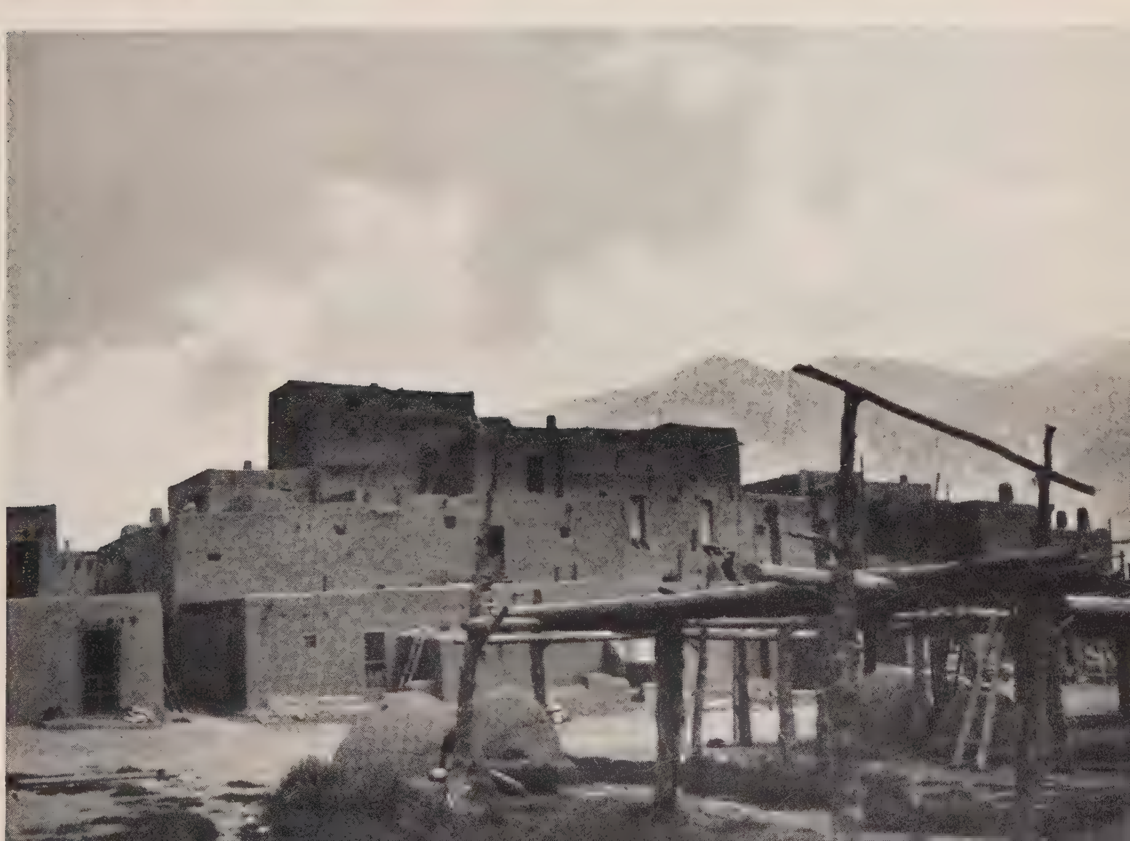
Today there are twenty-seven, not counting small offshoots, but the life in them is much like that of ancient days, except for modern dress, farm tools and Roman Catholic ceremonies. As of old, the village is built around a plaza whose floor is still sometimes pierced by the openings for those underground chambers which served as temples, workrooms and gossiping-places for the men. Around the plaza, in olden days, the little square houses of stone or baked clay rose in receding tiers, the roofs of each tier serving as balcony and outdoor workroom for the houses of the tier behind. Now only one village sticks to the old plan, with houses rising as high as four storeys. The one-storey houses of the others often give them the air of Mexican country towns.

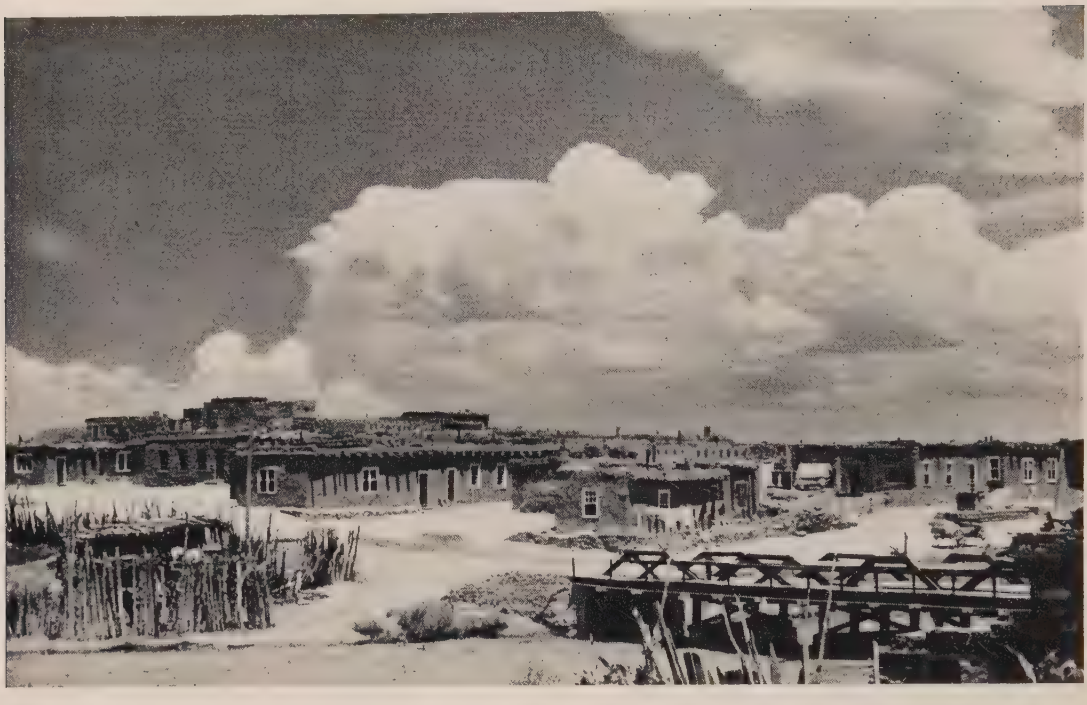
In former days, ascent from one storey to the other was by a notched log, leaned against the house roof. There were no outside doors or windows and the house was entered through a hatchway in the roof down which one climbed on another notched log. A task for the housewife, balancing a jar of water on her head! Now regular ladders have replaced the notched logs, doorways have painted frames and doors from the carpenter's shop, windows have glass and sometimes screens. At least they often do, but there is one pueblo



All photographs by Lilian J. Reichar

In the South-western United States there are hundreds of ruined Indian villages (above), *'giant grey honey-combs' terracing the hillsides, built mainly from 900 to 1300* A.D. *The Spaniards arriving in 1540 found less than forty such* pueblos, *of whose life only one still occupied affords some reminder* (below)





The modern pueblos are no longer terraced; and the one-storey houses show many improvements, such as doors with painted frames instead of hatchways reached by ladder, and glazed windows

which has made a rule against glass, for its old men know that the first step in change may open the way to loss of many things held dear and sacred.

Within the houses one may see earthen floors, a pile of sheepskins, an earthen fireplace and a tuft of eagle feathers. Perhaps the village is more advanced and there are woollen blankets and a saint's picture. Or if it is most advanced there will be an oil stove, an iron bed and an advertising calendar. The people who emerge may wear slit trousers in the old Spanish style or a handwoven woman's mantle of dark-blue cotton, fastened on one shoulder. Or they may wear the blue jeans of the American farmer and the calico frock of his wife. On days of ceremony, however, no matter how modern they may be, they revert to the beautiful handwoven kilts and mantles, the tufts of parrot feathers and the strings of turquoise in which they have honoured the gods for centuries.

The United States, when it took over their land, confirmed the Spanish grants, so that most of the pueblos actually have title to their property, a status almost unique in the country. They hold it like corporations, distributing its use among their members as they see fit. One distant little group was thought too far in the desert to receive a grant and so has now received a reservation and a superintendent of its own. Over the others is a superintendent, with offices in a near-by white man's town, where the Indians need come to see her only if they think fit. (The superintendent, trained in anthropology and medicine, happens to be a woman.) Under her are the hospitals, the schools, the visiting nurses, the farm advisers who attempt to give to the pueblo citizen as much as he needs of the white man's knowledge without destroying his own interests and capacities.

The pueblos want schools. Their people have centuries of experience in crafts and trade and many of them go to the white man's towns to work at masonry, carpentry, farming and housework, always with the plan of coming home to spend their declining years in the pueblo. They need English and arithmetic and a knowledge of machinery. They welcome the day school which stands in each pueblo and its teachers are expected to be their neighbours and friends. In one case the school is just outside the village and the teachers are requested to keep away when ceremonies are in progress. They do so.

The schools, however, have full attendance. Pueblo children go through the same grades as white children and finish at about the same age. At home, they speak Indian, or a mixture of Indian and Spanish. At school, they speak English. Indian Service workers, both Indian and white, are working to produce books for them, in the vocabulary they will use and on the subjects they know. Some lines from one of the new Indian readers have the rhythm of their own ancient songs:

The Plaza is the place
For all the people.
In the plaza the people work
And dance and sing
Together.
Always together.
And our houses
With their backs to the mountains
Stand facing the plaza
And shut us in.

Two boarding schools in the white men's towns prepare pueblo girls and boys for skilled work, one specializing in agriculture, one in handicrafts, music and painting. Agriculture has its problems, as in

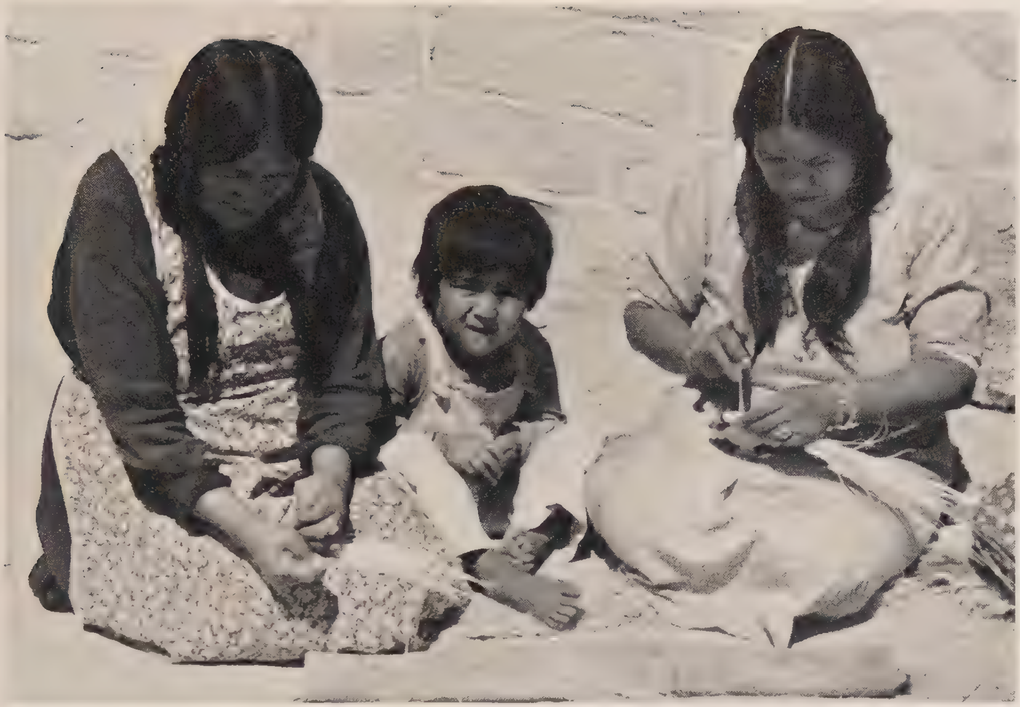
Schools are popular. The Indian children need English, arithmetic and a knowledge of machinery; after finishing with day school, they may go to high school, vocational school and perhaps to college the village where the old men refused to allow ploughs and tractors, on the basis that they had not been 'given' to the Indians by the supernaturals who gave the sacred maize. "However," argued the Government representative, "the supernaturals did not know that you would have horses and sheep to feed as well as yourselves. For these white man's animals, steel tools ought to be allowable." He was approved, but there is still the problem of how to treat soil erosion on a scientific basis with a people who believe that rain is a response to piety and that maize is the Mother who bestows her blessings on the good. Many a Government worker, too, has been humbled by the realization that these desert farmers know more about their particular variety of drought-resistant maize than any agricultural expert.

Arts and crafts meet with less resistance. It is pueblo crafts which are taught and by pueblo teachers, the reason being that this sort of work is lapsing at home. One can hardly blame the workers. One day of paid work for the white man will buy a wealth of calico, tin pans and pink glass dishes, when to make their equivalent might take half a year. The Indian cannot, in fact, afford to supply himself by his own handicraft! He can spend his working days upon it only if it brings him money. So Indian pots and baskets are appearing on the shelves of the rich, while the Indian invests the proceeds at the ten-cent store. The school has to recognize this and to take as its function the teaching of handicrafts which will be beautiful in the best old tradition. The Government, too, has instituted an Arts and Crafts Board which will place something in the nature of a hallmark on work which is up to a high Indian standard and actually made by Indians. Next comes the problem of creating a good market for such work. It will take time in a country where things Indian are too recent and too familiar to be the fashion; but the Board has plans. One of them is a striking exhibition at the San Francisco fair, in which beautiful Indian products are shown advantageously in modernistic rooms.

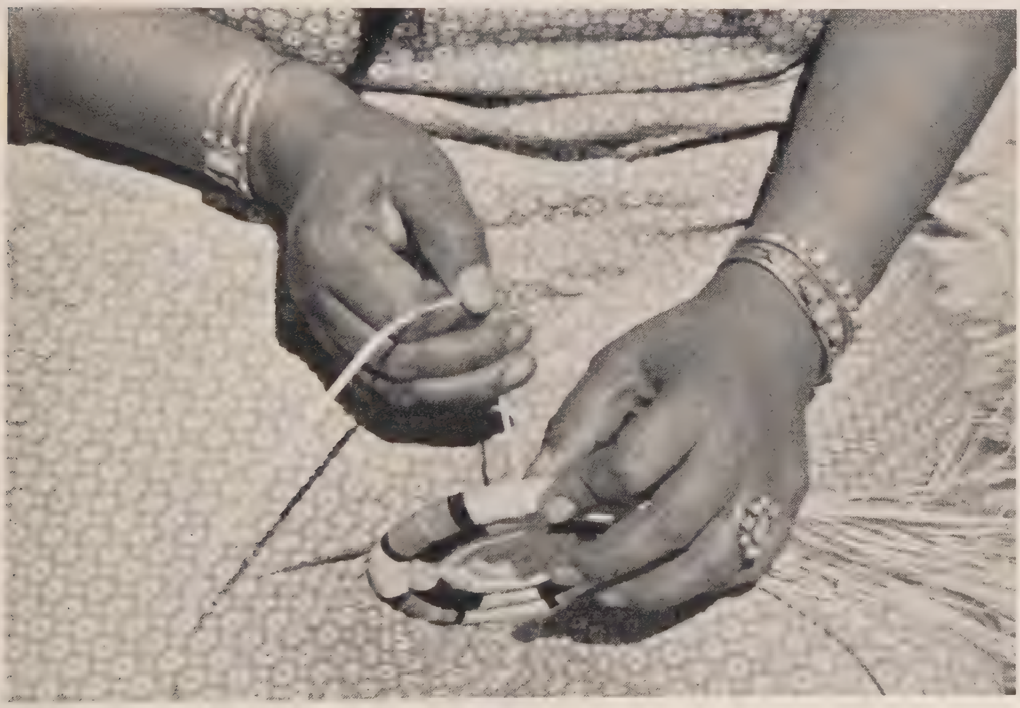
Meantime the pueblos are marketing their own product. Their ancient crafts were weaving for men, pottery and basket-making for women. The beautiful woven kilts and ceremonial sashes of creamy white cotton are made now only at the Hopi pueblos, the remotest of the group. It is Indians who buy them, for they are still *de rigueur* in ceremonial dances, and delegations come from all the other pueblos bearing turquoise to trade for them, after the ancient manner.

Basket-work is lapsing, too, for 'the young girls don't like to tear their fingers on the tough yucca'. But some Hopi villages still make the brilliantly coloured basket trays on which ground maize is carried before a bridal procession and on which the soul of a husband floats away after death over the rim of the gigantic gorge called the Grand Canyon. The schools have to be chary of teaching basket-work for the decorations have ceremonial meanings and girls may not learn them until a certain age Nevertheless Hopi basket-making still flourishes, each type restricted to certain villages, as one used to find the crafts in ancient hamlets of Europe.

One *mesa* or flat rock topped by several villages makes baskets of thick, concentric coils such as are made nowhere else but in Africa. Here, on a sunny afternoon, you may see a whole group of women, in modern dress, their little hands decorated with their native hammered jewelry, busy at the making of centres, which are the tricky part of the work. They present their labours to the hostess who has furnished the material and who now has centres enough for several months' work. Another day they will all make centres for someone else. The finished baskets are loaded on a donkey, which the Hopi have learned from the Spaniards to call a *burro*,



Although basket-work is lapsing, it is still a regular industry in many villages. One mesa *holds 'basket bees', at which, in return for meals and material, the hostess is provided—*



—with enough centres (the most difficult part of the work) to last her for several months

Another ancient craft, which, like basket-making, finds its chief stimulant in the white man's purse, is pottery. Though styles have changed gradually, old methods are still used

Some new industries have supplemented the old. One of these is silverwork, which the Indians learned from Spanish craftsmen about a century ago; it has become 'a special art, simple and striking', and provides a fair living

To encourage traditional Indian handicrafts in the best and purest forms, the government has instituted an Arts and Crafts Board. Its main problem is to find and maintain a steady market

and taken to a white man licensed to trade on Hopi land. The trader in return measures out dried beans, coffee and calico. He will sell the baskets to some stray tourist who has pressed his car for a day through the desert heat. Later, when the plans of the Arts and Crafts Board materialize, he will receive orders for such baskets from New York shops, at a fixed price.

The real industry of the pueblos is pottery. From earliest days each hamlet has had its own characteristic style so fixed that archaeologists can recognize it even from a sherd. The pots are built up by hand, without a potter's wheel, painted freehand in black, cream white and Venetian red and baked for hours out-of-doors, under a pile of slow embers. They are still made thus and, though the styles have changed gradually, each village retains its distinctive manner.

Early on Saturday morning, in the picturesque city of Santa Fé, once a Spanish 'villa', you may see pueblo women in high white moccasins and full calico skirts alighting from ancient Fords driven by their husbands and bearing huge sacks stuffed with the carefully packed pottery which has been their week's work. They seat themselves on the pavement under the portico of the old Governor's Palace and watch silently under their bangs of black hair for the passing tourist. Or, driving down the ribbon of paved road across the desert where Spanish soldiers and horses used to die of thirst, you may see a little arbour

The Indians could not have resisted the changes around them had they not retained unimpaired their interest in farming. Maize, the foundation of pre-Columbian agriculture, remains the predominant crop

of boughs to which a whole family have trudged from their distant village behind the hills. Silently they hold their pots toward you, for they do not speak English. They take the dimes and the quarters brought from New York, Chicago or San Francisco and they return to the village. Pueblo people have seen plenty of the civilized life of the Whites and few have a yearning to share it.

They have some new crafts as well as the old. A hundred years ago the Spaniards brought silversmiths to their country and they and other Indians learned to hammer out simple bracelets and pendants. They decorated them with the native turquoise and now their silverwork is a special art, simple and striking, a product of white and Indian genius mixed. Beadwork is another mixture, for it did not exist before the Whites brought glass beads to exchange for furs. The pueblo Indians, not being hunters, never had beads in olden days but they realize that, according to popular opinion, Indians should make beadwork. So they do it. Their skilled fingers and alert trade instinct produce little bead dolls and buffalo heads which they sell by the gross. Whole families make their living in this way, importing their beads until lately from Czecho-Slovakia via New York.

Another art has arisen with white man's inspiration but genuine Indian technique. This is painting in water-colour. At the Santa Fé boarding school there is an art class with an Indian teacher trained by the Whites. She encourages her pupils to depict scenes of native life and under her guidance they have developed their own clear-cut, two-dimensional style, as brilliant and jewel-like as a Chinese or Persian miniature. Already they have exhibited in New York and Paris and the sales orders keep the class going.

Few pueblo people, however, support a family by art or handicraft. Some painters have gone out into the white man's world. Some potters have turned their houses into shops, like that of the famous Maria Martinez, visited by tourists from all over the country. As a rule, the painter is a farmer too; the potter sells her wares only to augment the income of her farming husband. They carry their product to the cities, they even visit exhibitions, but they return to the pueblo where life goes on without electricity or running water, where entertainment and social life are all comprised in the round of religious pageants. It is a conscious withdrawal. Pueblo people have had white neighbours and even white teachers for over three hundred years and they could have changed their life completely. Instead, they have taken only those items which met some need. Clothing, pans, oil stoves, meat grinders to substitute for the stone grinding-slab, the red rubber of an inner tire instead of dyed buckskin—these appealed to a people adept in crafts. But the council of old men knows that even a little change in the social structure may mean ultimate collapse. They summon their boys home from school for the periods of ceremony. Some pueblos forbid marriage outside the village. One has rules against glass windows or white man's hats and shoes. All object to talking about their organization and their religion.

They could not have resisted so firmly the changes around them, had they not

New agricultural methods are slowly being adopted. Although some farmers still make their horses' hooves do the threshing, as above, most prefer to rent a modern thresher from the government

From a secure base of ancient tradition and property rights protected by the government, the Indian faces the modern world with calm

had an interest in life which has never been interfered with—agriculture. Once their little patches raised only corn, beans and squash enough to feed the family. Then the Spaniards brought seeds of fruit and European vegetables, even some sheep, donkeys and cows. The pueblos accepted these novelties, like intelligent farmers, and when they asked the gods for increase, they included sheep in their prayers. Still, they saw no reason to change their farming methods. Their land belonged to the whole village, as always, and the council of old men portioned it out among the family heads, reassigning the plots according to need. Herds were tended in common. Produce was exchanged according to an elaborate system of gifts which took the place of taxes and of church dues. Farming supplied them with a livelihood, an organization and a religion.

Nevertheless it is through farming that change is likely to come, after all these centuries. Some pueblo land had passed into other hands and the United States, bound in honour to keep it intact for the Indians, has been paying them back in land or money. Hundreds of thousands of dollars are coming to the pueblos in this way and the councils are spending it. Not for luxuries! It goes for land if possible, then farm machinery and, at last, lighting and water. These are no impositions from without to be fought tooth and nail. When the pueblo itself has bought a tractor, it treats it with the same reverent pride as used to be felt for the old digging stick and winnowing basket. The villages, one by one, are adopting these innovations for their own just as, in barbarous days, they adopted the maize.

Nor can they keep aloof from the Whites in their new farming. Some of their villages are in the valley of the Rio Grande, Great River of the North, as the Spaniards named it and now one of the most densely populated rural districts in the United States. No one can any longer raise crops or graze herds there without supervision by the experts who are fighting the bugbear of soil erosion. Indians and Whites must handle the problem together. The Indians are doing so. White farmers who grow excited at being lectured on overgrazing might learn from a pueblo council which listens gravely, ranked on the benches in its smoke-filled community house. Two pueblos, convinced, have quietly cut their herds in half.

The Indian Office, too, has offered them a new form of organization by which they can form limited liability companies, manage their property and borrow Government funds. The arrangement is open to all Indians and a few pueblos have taken advantage of it while others stick to their ancient system. Their satisfying community life is the very goal toward which many a white group is striving. How can its virtues be retained and brought over into the new life?